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THE
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ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding that they are contributed exclusively to THE LARYNGOSCOPE.)

HISTORY OF BRONCHOSCOPY AND ESOPHAGOSCOPY FOR FOREIGN BODY.

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In a previous paper were presented historical data on foreign bodies in the air and food passages in the pre-endoscopic days. The purpose of the present paper is to present data from the literature since the introduction of direct laryngoscopy, bronchoscopy, esophagoscopy and gastroscopy.

While the present paper is concerned with foreign body cases only, brief mention of the initial stages of endoscopy seems indicated. Almost every advance in medicine has a complex history, and prominent and valuable discoveries in medical science have reached completion gradually. Thoughtful minds at different epochs have been occupied with attempts to overcome the same difficulties and to solve identical problems. This is true of the evolution of the direct method of examining the respiratory passages and digestive tract.

HISTORICAL NOTES.

Bozini,[1] in 1807, examined the upper end of the esophagus.

Voltolini[2] and Waldenberg, in 1860, devised esophageal specula.

The first attempt to examine the gullet during life would seem to have been made by Semeleder and Stoerk in 1866.[3] The idea of the instrument, a forceps with spoon-shaped blades, originated with Semeleder, who offered himself to Stoerk for experiment. After the introduction of the instrument the laryngeal mirror was placed in the ordinary position, but it was found that the view was obstructed by a projection of the mucous membrane between the blades of the instrument and the experiment yielded negative results.

In 1868, Waldenberg[4] invented an esophagoscope. This instrument was made of gum elastic and was 8 c.m. in length. It was slightly conical in shape, the diameter above being 1½ c.m., and below, 1 c.m. It was connected to the extremity of a two-pronged fork, 14 c.m. in length, in such a way that considerable movement was permitted. After the introduction of the instrument it was held with the left hand, and the tongue being slightly pressed down, the laryngeal mirror was put into the mouth. Waldenberg introduced his instrument into a pouch at the upper part of the gullet on the left side and was able to see that the diverticulum contained broth, but that the mucous membrane was not ulcerated or diseased.

Subsequently, Waldenberg[5] had an instrument made of metal instead of gum elastic, consisting of two tubes arranged telescopically, each tube being 6 c.m. in length, the one playing on the other by means of a slot. Waldenberg's instrument was exhibited and used on a patient by Professor Stoerk before the Society of Physicians of Vienna. Subsequently, Stoerk employed an instrument resembling Waldenberg's, but consisting of three tubes.

In 1868, Kussmaul[6] accomplished the first direct esophagoscopy, using a Desormeaux urethroscope elongated to 43 c.m. He saw with extreme clearness a carcinoma in the thoracic esophagus and demonstrated the possibility of introducing rigid tubes to the deepest parts of the esophagus, using the "sword-swallowing" position.

Muller,[7] who experimented with the method under Kussmaul's direction, found that a tube of 13 m.m. thickness could be introduced into all normally proportioned patients.

Trouve,[8] in 1873, designed a polyscope, consisting of a tube having a window, and fitted with prisms and lenses, constituting an optical apparatus. This was used by Sedentu and Reynand for esophagoscopy.

Mikulicz,[9] in 1881, with the aid of Mr. Leiter, designed an esophagoscope consisting of a tube into which an optic apparatus was slid after the removal of the mandarin used to facilitate introduction of the tube into the esophagus. He also examined the stomach with an elongated form of his esophagoscope by adding an angle and an additional prism.

February, 1880,[10] Morell Mackenzie began to use his esophagoscope, which consisted of two parts—a stem and a skeleton tube. The stem was made up of a handle and a shank, between which was a hinge. The skeleton tube was only formed when the instrument had been introduced into the gullet; before, it consisted of two flattened wires placed anteriorly and posteriorly, connected above and below, and at certain intervals between these points, by rings. When

the rings lay in the vertical position, the wires were separated from each other only by the thickness of the rings, but when the latter were thrown into the horizontal position, the two wires became separated, and with the rings constituted a kind of skeleton speculum. At the top of the back wire there was a slot, into which the stem of a laryngeal mirror was fitted. When the "body" had been passed down the esophagus, the operator, holding the handle in his hand, but leaving the index finger free, pressed with the latter on the upper part of the shank, near the handle. The result of this was to turn the rings from the vertical to the horizontal position and thus to open the speculum and expand the gullet with a view of causing as little irritation as possible. Before withdrawing the instrument, the operator closed the speculum by pressing the under part of the shank (near the handle) with his thumb. In November, 1880, Mackenzie had succeeded in examining the esophagus in thirty-seven out of fifty patients.

In February, 1881, Prof. Stoerk[11] described a new esophagoscope which consisted of a lobster-jointed tube covered with India rubber, with a small mirror attached to its upper extremity, and with a handle, consisting of a two-pronged fork like that of Waldenberg's. This tube was provided with a pilot or director, consisting of a piece of elastic tubing terminating in a small bag, which projected beyond the end of the esophagoscope, the diameter of the bag being a little larger than the tube. The bell being inflated, the instrument was passed into the gullet when the air was allowed to escape and the pilot withdrawn.

Gottstein,[12] in 1891, advocated esophagoscopy under cocain anesthesia. Prior work having been all done under either general anesthesia or morphin narcosis, mostly the latter.

In developing the technique of esophagoscopy, von Mikulicz, von Hacker, Rosenheim and Andere are distinguished.

Einhorn,[13] in 1902, devised an esophagoscope having an auxiliary tube made in the wall of the main tube. In the auxiliary tube was inserted a light carrier which served as a double conducting wire to carry current to the electric lamp which it carried to the distal end of the tube.

In 1828, Horace Green,[14] of New York, conceived the idea of medicating the cavity of the larynx by catheterization and thus discovered the law of the tolerance of the larynx to the presence of a foreign body. He made a probang of whalebone about 10 inches in length, curved at one end, to which was securely attached a small, round piece of fine sponge, and with this probang introduced a solution of nitrate of silver into the larynx. After[15] overcoming some

difficulties he became expert in catheterizing the larynx and bronchi, using a 13-inch gum elastic catheter (No. 11 or 12), calculating that the distance from the incisor teeth to the tracheal bifurcation was about 8 inches in the normal adult. He introduced the catheter so as to leave only 2 inches projecting from the mouth, therefore its lower extremity must reach into one of the bronchi. He then introduced one-half to one and one-half ounces of a solution of silver nitrate (10-25 grains to the ounce of water) into the bronchi with a syringe. He reported the results of his work to the Medical and Surgical Society of New York in 1847. His claims were promptly condemned by the Society as "an anatomical impossibility and an unwarrantable innovation in practical medicine" and he was asked to withdraw from membership.

However, a few years later the claims of Horace Green were universally conceded, not only in America, but in England, and the continent, and thus the great fundamental physiological principle of the tolerance of the larynx to the presence of a foreign body was for the first time in modern history irrefutably established. Upon it has depended absolutely the present science of laryngoscopy and bronchoscopy.

In 1885, Joseph O'Dwyer, after working for several years, perfected his intubation tube for the relief of acute and chronic stenosis of the larynx. The O'Dwyer intubation tube has stood the test of time as it is still made after the original model. Birkett states that O'Dwyer[16] also "recognized the inevitable disaster resulting from a foreign body remaining in a bronchus and constructed a special tube with a thin wall and a calibre as large as possible for the purpose of facilitating the expulsion of a foreign body from the trachea or a bronchus." He realized the necessity for bronchoscopy, but failed to develop it farther.

Thus the work of Green and O'Dwyer established the fundamental principles in the evolution of bronchoscopy, namely, the tolerance of the larynx to the presence of a foreign body, and the tolerance of the larynx to the continued presence of a foreign body.

The principle of esophagoscopy was soon used for direct inspection of the larynx, the trachea and the bronchial tubes. von Hacker[17] was the first to see the possibility of directly observing the larynx and trachea. He published his results in 1901.

Mikulicz,[18] in 1896, reported successful cases of tracheoscopy.

Kirkstein[19] recognized the clinical advances made in direct examination of the larynx and developed suitable technique. He finally developed a single, long, slender spatula slightly curved in front, with a rectangular handle, the so-called "universal spatula," and as

a real advance saw that in the use of the spatula cocain could be dispensed with. According to Kirstein's own estimate, about one-fourth of the whole larynx and trachea of a conscious individual is readily visible and two-fourths more show a fair degree of visibilty. He called his method "autoscopy."

Although Kirstein[20] confirmed Rosenheim's discovery that it was possible to get a straight tube into the trachea, he did not pursue any further investigations along that line, and warned against the entering of the lower part of the trachea as a highly dangerous practice.

That it was easily possible to introduce the tubes into the entrance of the main bronchi was demonstrated by Killian in 1897.[21] However, before he dared go further downward with rigid tubes, he first showed that the large bronchi have thick, solid walls, supported by cartilage, that the bronchial tubes themselves have a high degree of elasticity, and, finally, and most important, that they are movable. These were the greatest steps in peroral bronchoscopy.

In 1901, von Schotter and Pieniazek[22] inspected the deeper air passages through a tracheotomy wound by means of a funnel-shaped tube. Pieniazek observed that by this means not only the lower section of the trachea, but also the bifurcation and entrances into the bronchi, could be brought into view. Pieniazek penetrated into the lower and middle branches of the right main bronchus and deep into the left main bronchus.

Killian published the results of his researches in 1898 and called his method "direct bronchoscopy."[23] In 1902, he demonstrated the necessity of having side openings in the lower end of the bronchoscope to enable the patient to breathe with the healthy lung while the other bronchus was blocked by a foreign body.[24]

Ingals,[25] in 1904, used a separate light carrier in a Killian tube. He recognized the value of teamwork involved in successful endoscopic procedures, and stated that he heartily commended the operation, but apprehended that as a rule "no one excepting an expert laryngologist would have the patience and skill requisite for success." In 1905,[26] while doing bronchoscopy on a child of two years, he observed the rhythmical dilatation and contraction of the bronchi during inspiration and expiration and as these movements were not present in the larger bronchi of adults, he deduced that the greater rigidity of the cartilages in the larger bronchi prevented movement while the movements were present in smaller bronchi at all ages. His experiments upon dogs confirmed his claims for the rhythmic movements of the bronchi during respiration.

He[27] had a spiral series of small perforations, 2 x 4 m.m., made at the lower end of the bronchoscope to maintain respiration instead of the large oval opening of Killian.

Jackson, in 1904,[28] combined the lighting principle of the Einhorn esophagoscope with the tube of Killian, and in 1905 he designed a bronchoscope in which, in addition to the auxiliary canal, a drainage canal was placed. In 1906, he described a gastroscope he had devised and reported a series of fourteen cases in which he had obtained results of value from gastroscopy.

It is to Jackson that credit must be given for the impetus given to the development of endoscopy and for the high degree of efficiency attained by this branch of medicine in the last few years. His unselfish and untiring devotion to the development and teaching of "safe bronchoscopy" can be attested by students all over the Eastern as well as the Western hemisphere.

EARLY ESOPHAGOSCOPY FOR FOREIGN BODIES.

In 1902, Killian[29] stated that "direct esophagoscopy is the only absolutely reliable method of removing foreign bodies, because bougies may pass foreign bodies in the esophagus without touching them and sometimes the radiograph will not show objects because of their character or because they are hidden by the shadow of the vertebrae." He showed a large pointed bone removed from the gullet of a woman, age 79 years, by esophagoscopy.

Ingals,[30] in 1903, removed a fleur-de-lis pin from the esophagus of a girl, age 2½ years, under chloroform anesthesia.

Coolidge,[31] in 1905, reported the removal of an open safety-pin, point up, from the esophagus of a woman, age 20 years. Under ether anesthesia, he passed a Killian esophagoscope through a Kirstein atuoscope and with Mosher's safety-pin closer, closed the pin and removed it.

Jackson,[32] in 1905, reported two cases of foreign bodies removed from the esophagus by esophagoscopy. The one case in which a pin, point down, was removed, using a urethroscope for esophagoscopy; and the other, a double-pointed tack in a boy, age 18 years. removed by esophagoscopy, using an esophagoscope. He does not mention anesthesia. In 1906, he reports a case of foreign body removed from the stomach by gastroscopy.

EARLY DIRECT LARYNGOSCOPY FOR FOREIGN BODY.

The earliest case I have been able to find was the removal by Jackson[33] of a bay leaf from the orifice of the larynx with the Kirstein autoscope.

Killian, in 1902,[34] recommends especially direct laryngoscopy through a straight tube for removal of foreign bodies from the

larynx of children. In these cases direct laryngoscopy could always be successfully employed, especially after administration of an anesthetic with the patient's head held in a dependent position. If there was much dyspnea he advised preliminary tracheotomy. He had been able to remove a tightly fixed collar stud from the larynx.

EARLY TRACHEOSCOPY AND BRONCHOSCOPY.

Direct tracheoscopy with the tube first attained an actual clinical significance when Killian,[35] in 1897, succeeded by means of it in removing a bone from the right bronchus through the natural passages. This wonderful feat suggested the thought that it might be possible to remove foreign bodies from the deeper bronchial passages under the control of the eye. If the foreign body was only just beyond the bifurcation,[36] upper and lower direct tracheoscopy was all that was necessary for diagnosis and extraction. If deeper down, tubes of greater length were employed, which were introduced into the bronchi. Thus, out of Killian's upper and lower tracheoscopy his methods of upper and lower bronchoscopy were evolved. It was realized that bronchoscopy allowed the larger branches of the whole bronchial tree to be searched. Though the left principle branches branched off at a sharper lateral angle, it was through gentle pressure brought almost as easily into view as the right. The fact that the bronchi could be explored through a straight tube with comparatively little danger to the patient revolutionized the treatment of foreign body cases.

The operation was termed upper bronchoscopy when the instrument was introduced through the mouth and larynx; lower bronchoscopy when the bronchoscope was introduced through an opening made in the trachea.

Ingals[37] stated in 1905 that upper bronchoscopy is much more difficult because of the difficulty in passing the bronchoscope through the glottis and somewhat more difficult because of the greater length of tube to be illuminated and because of more trouble in turning the bronchoscope into the bronchus from the trachea, but it possesses the advantage of not requiring any wound in the trachea. A larger tube may be used in the trachea than can be passed through the larynx, but with lower bronchoscopy there is a temptation to use a bronchoscope of too large calibre from which the stretching of the bronchi may be detrimental. Lower bronchoscopy necessitates tracheotomy, which is an added danger to the patient.

In 1905, Jackson[38] published investigations as to the use of a magnet for removal of magnetizable foreign bodies.

Coolidge,[39] in 1906, states that "upper bronchoscopy is, of course, the ideal method of extracting foreign bodies. The passage of the

bronchoscope involves little danger, no after-treatment and no scar. Nevertheless, lower bronchoscopy is an operation of great value. The upper route is theoretically more liable to lead to infection of the lower air passages than tracheotomy, because the tubes must necessarily come in contact with the mouth and pharynx. Experience, however, does not seem to prove this danger."

In 1898, Coolidge[40] removed a tracheal canula, using a urethroscope, 3 inches long and ½ inch in diameter through the tracheal wound, under ether anesthesia.

In 1902, J. A. Killian[41] reported the removal of a fish bone 22 m.m. long from the left bronchus of a child, age 3½ years, under control of the eye by means of bronchoscopy without injuring the tissues.

In 1904, Ingals[42] reported that a careful search of the literature indicated that up to June, 1904, bronchoscopy had been done in thirty-four cases, with successful removal of foreign bodies nineteen times.

G. Killian[43] reported eleven cases of bronchoscopy in 1902, in nine of which upper bronchoscopy was employed.

In 1904,[44] lower bronchoscopy had been employed by G. Killian in three cases; Coolidge, two; von Eiken, Neumeyer, Hajek, Spiess, Harrington, Wild, Lermoyez, Guisez, Bodmer and Schoyber each one.

In 1904,[45] Ingals removed a large glass-headed pin from the right bronchus of a girl, age 17 years, under chloroform anesthesia in 1½ hours. He also removed a collar button from a bronchus and evacuated a large abscess after working two hours with chloroform anesthesia.

In 1905, Coolidge[46] removed a prune stone from the right bronchus of a boy, age 8 years, by lower bronchoscopy under ether anesthesia, and a shingle nail by upper bronchoscopy under ether anesthesia. In another case he first employed upper and then lower bronchoscopy to remove a hook from a child, age 2 years.

Jackson,[47] in 1905, reported the case of a shoe button removed from the trachea of a young woman, age 18 years, with Killian's tracheoscope.

Yankauer,[48] in 1905, removed an orange pit from the right bronchus of a child, age 10 months, by inferior bronchoscopy under chloroform anesthesia.

Mortality: The percentage of mortality in the early days of bronchoscopy, 25 per cent, seems appalling to us now. The reduction of this mortality has been largely due to the discovery of Ingals and the teaching of Jackson. Two phases of the work were the

chief factors involved: *1*, carefulness of manipulations; *2*, shortness of the duration of bronchoscopy.

Ingals was the first to discover that prolonged bronchoscopies are dangerous in children.

Following this discovery by Ingals that prolonged bronchoscopies are dangerous in children, especially under 2 years of age, Jackson started to minimize the time of bronchoscopy. He and Ellen J. Patterson started the use of the stop-watch in the operating room and made a study of the elimination of time-wasting.

Jackson eliminated the use of general anesthesia in all endoscopic procedures.

Results: Jackson's statistics show that about 98 per cent of localizable aspirated foreign bodies in the bronchi can be removed by bronchoscopy through the mouth.

Bronchoscopy for the diagnosis and treatment of pulmonary disease of other than foreign body origin has made such enormous strides in recent years that it seems essential that every large hospital will require a bronchoscopic clinic; that the near future will see the inspection of the interior of the bronchi an important part of medical diagnosis; that every thoracic surgeon will require a bronchoscopic assistant.

GLEANINGS OF FUNDAMENTALS FROM ENDOSCOPIC HISTORY.

1. Killian,[49] 1902: "For the removal of foreign bodies from the bronchi, a good view, great care and quietness in procedure, are essential."

2. Ingals,[50] 1905: "I apprehend that as a rule, no one, excepting an expert laryngologist, will have the patience and skill requisite for success."

3. Coolidge,[51] 1905: "It is important to have proper instruments at hand to extract the foreign body after it is found. Nothing is more tantalizing than to have your quarry in full sight and not be able to reach it or hold it."

4. Jackson,[52] 1921: "Oral or tracheotomic route according to the equation of the case, the operator and the available armamentarium."

"All new instruments should be thoroughly tested, first upon the rubber tube, then upon the cadaver, next upon the living dog, and finally upon the adult, before attempting to use them upon a child."

5. Jackson,[52] 1922: "Endoscopic ability cannot be bought with instruments."

6. Campbell[54] in *Journal of Laryngology and Otology*, 1922: "Bronchoscopy looks dangerously easy when one watches Dr. Jackson at work, but one must remember the years of patient work and research before these results were possible." He agrees with Jack-

son that concentrated work with rubber manikins, dog or cadaver will eventually solve any problem of bronchoscopic removal.

7. McCrae,[55] 1924: "The interpretation of the physical signs due to a foreign body in a bronchus will not prove easy for one who solves the problems of physical diagnosis by rule of thumb. In some cases the findings are easy to interpret, but often there are puzzling signs which require care for proper valuation. This is especially true in children in whom there are more variations, especially in the signs obtained on percussion, than in adults."

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Obviously in so huge a task it is possible only to present outstanding features; but to supplement this I have appended a bibliography which I venture to hope includes the more important of all the articles that have appeared since 1914. The literature prior to that time was comprehensively listed in bibliographies appended to the two books by Chevalier Jackson. Tracheoscopy, Esophagoscopy and Gastroscopy, 1907, and Peroral Endoscopy and Laryngeal Surgery, 1914. In addition, bibliographic references are given to articles referred to in the text of the present paper.

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PRESENTATION OF INSTRUMENTS.

DR. CHEVALIER JACKSON, Philadelphia.

Dr. Chevalier Jackson exhibited:

1. A forceps especially devised to grasp a piece of nasal rasp broken off at a sinus operation and aspirated into the lung.

2. A left-bronchus aspirator (see Fig. 1).

3. An open manikin board for working out the solution of mechanical problems, for lecture demonstration, for practice and for teaching purposes (Fig. 2).

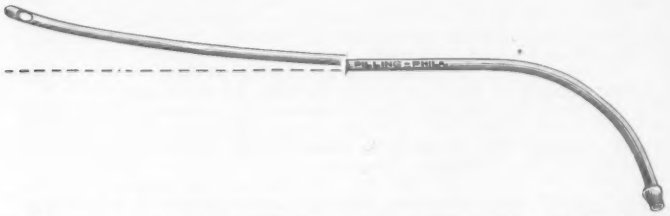


Fig. 1. A left-bronchus aspirator used for aspiration through the direct laryngoscope without the insertion of a bronchoscope. The straight aspirating tube will go into the right bronchus; this tube is so shaped that it can be guided into the left main bronchus.

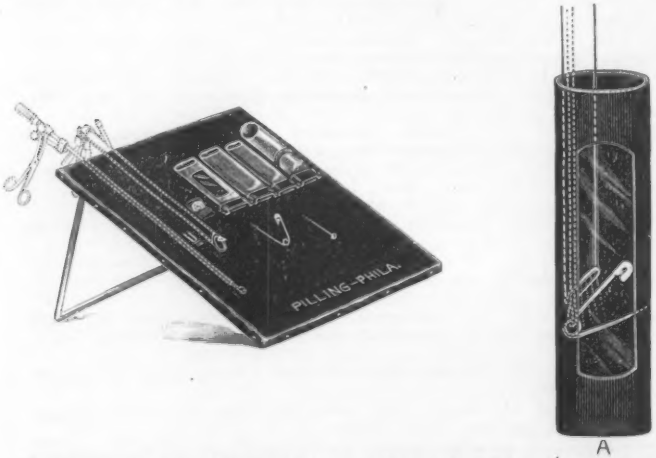


Fig. 2. An open manikin board for practice and for the working out of mechanical problems. The problem is first worked out on the cloth, then on the appropriate size of the rubber tubes simulating the esophagus and bronchus, respectively. This is the first line of the patient's defense. Next we proceed to the cadaver, then to the dog. After these we are prepared to work safely on the patient. The board is also useful for demonstration and for teaching.

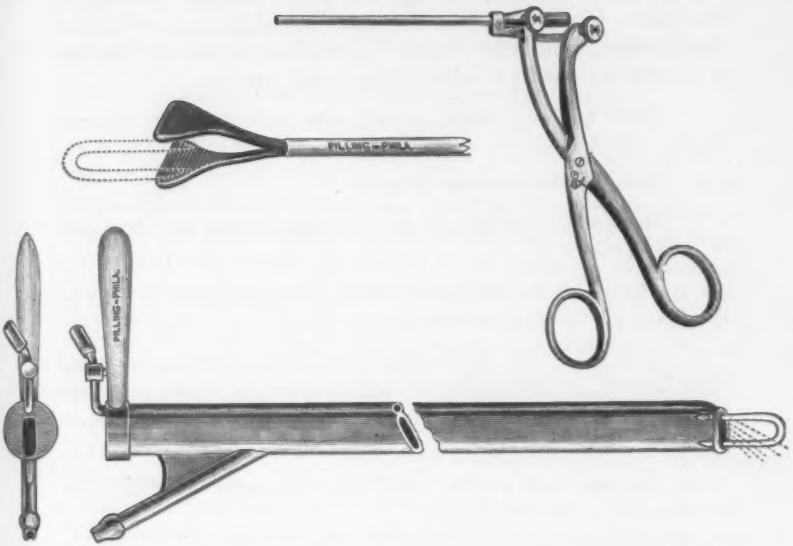


Fig. 3. A broad flat staple forceps and a staple bronchoscope. The broad forceps will cover the points, but it is better to make doubly sure they are covered by pushing down the staple bronchoscope over them. The important purpose of the broad forceps is to fix the staple, not only as to general wobbling about, but with the plane of its points in position to correspond with the major diameter of the bronchoscopic tube-mouth.

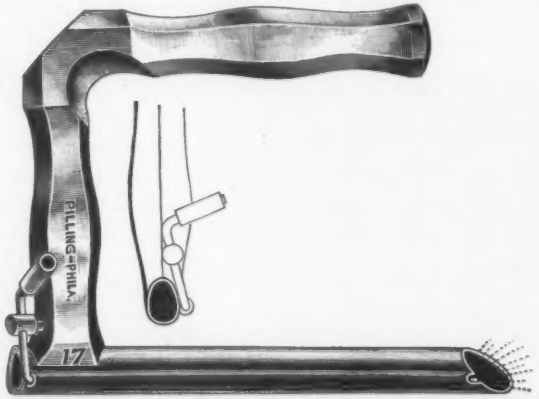


Fig. 4. Anterior commissure laryngoscope of Dr. Louis H. Clerf. The angle of the distal end of the instrument is more favorable for forceps work in the anterior commissure than is the standard form.

4. A roller bronchoscope suggested by Dr. Manges, to facilitate the removal of a safety-pin by the author's straightening and trailing point method. The roller obviates the tendency to bind on the edge of the tube by putting a roller bearing under the pin.

5. Three kinds of staple forceps, one devised by Dr. Gabriel Tucker, and two by Chevalier Jackson.

6. A staple bronchoscope (Fig. 3).

7. An anterior commissure laryngoscope devised by Dr. Louis H. Clerf (Fig. 4).

8. A modification of the Arrowsmith safety-pin closer devised by Dr. Louis H. Clerf, to fix the pin.

9. An atomizer for the insufflation of local anesthetic solutions when desired, to obviate the irritating contact of swabs or, when desired, for other reasons. A definite and limited quantity can be insufflated to the last drop.

10. An improved powder insufflator for pneumonography devised by Dr. L. H. Clerf.

128 South 10th Street.

THE UPPER LOBE BRONCHOSCOPE.

DR. MERVIN C. MYERSON,* New York.

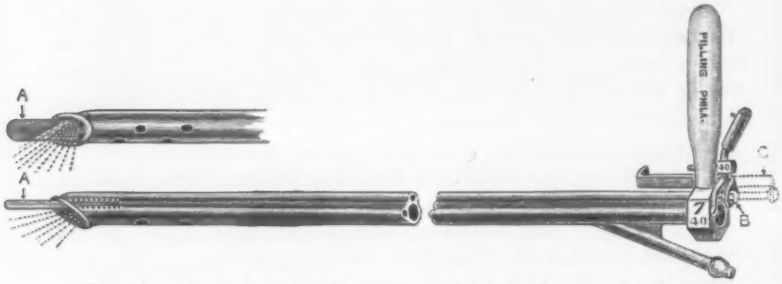
It is hardly necessary to call attention to the fact that up to the present time we have been unable to obtain a thorough view of the upper lobe bronchus of either side. Although the upper bronchus of the left side can, at times, be entered with the lip of the bronchoscope, its lumen cannot be viewed in its entirety. A descending bronchial branch can sometimes be seen, while the ascending or right branch cannot be brought into the line of vision. The occasional foreign body that lodges in the upper bronchus or its branches, and the pathology that has been found in this region, warrant the desire for a better exposure of these upper lobe structures. The ideal would be reached if we could obtain as good a view of the upper lobe bronchus and its branches as we can procure of the lower lobe structures.

The resiliency and mobility of the tracheobronchial structures are the principle properties that make bronchoscopy possible. Because of this mobility and resiliency, considerable displacement of the bronchial structures is obtainable. With this in mind, it was reasoned that we should be able to expose the lumen of the upper lobe bronchus with a straight tube. This would depend upon some mechanism that could bring the upper lobe bronchus down from a more or less vertical position to a more or less horizontal one. A 5 m.m. and a 7 m.m. Jackson bronchoscope were utilized as the basis for the new instrument. The floor of the bronchoscope was fitted with a sliding rod (A), to the distal end of which was attached a flat spatula end (B), one-half inch long and one-eighth or one-sixth of an inch in width. The small spatula end can be removed by unscrewing the sliding rod from it. The proximal end of the sliding rod was fitted with a thumb plate (C), so that the spatula end, which is hidden in the floor of the bronchoscope, could be advanced when required, by pushing in the thumb plate. The light carrier was placed into the side of the tube, so that during its passage the light comes either from the roof or floor of the bronchoscope. This lighting arrangement was necessary because the floor of the bronchoscope was utilized for the sliding rod.

The instrument is used as follows: The bronchoscope is passed down to the upper lobe bronchial orifice. The upper end of the lip is brought into contact with the proximal wall of the upper bron-

*Associate Laryngologist, Mt. Sinai Hospital.

chus. The upper wall of the main bronchus is now raised by the roof of the bronchoscope so as to bring the distal wall of the upper bronchus into view. When this is plainly seen and it is therefore above the level of the floor of the bronchoscope, the sliding spatula is slowly pushed out by means of the thumb plate and brings the distal wall of the bronchus from a more or less vertical to a more or less horizontal position. This in turn brings the entire bronchus into the same plane as the bronchoscope. This procedure exposes the upper lobe bronchus in its entirety and the main bronchus can be plainly seen. Bronchoscopy in this manner is more readily performed with the left upper bronchus, because of its more horizontal position.



The advantage of such an instrument in the management of upper lobe foreign bodies and in the diagnosis of upper bronchial lesions is readily understood. At the present time, upon purely theoretical grounds, it would be best to be cautious in the matter of upper lobe bronchoscopy in the presence of suspected upper lobe adhesions.

Shortly after this instrument had been devised and used, it was learned that Dr. Yankauer had been using a device for the same purpose for several months before the idea was put into practice by the writer.

"Dr. Yankauer's device consists of a tube, open on one side, somewhat pointed at the end, and curved with the concavity toward the closed side. When this is introduced into the bronchoscope, the curved end projects from the distal end of the bronchoscope and enters a branch bronchus. By rotating the apparatus while in this position the branch bronchus is brought into axial relation with the bronchoscope so that the light (Dr. Yankauer uses proximal illumination) can be thrown down into the branch bronchus as far as the axial relationship exists."

30 East 40th Street.

EXOSTOSES OF THE CERVICAL VERTEBRAE AS A CAUSE FOR DIFFICULTY IN SWALLOWING.

Dr. Harris P. Mosher, Boston.

I have recently become interested in the study of the esophagus of the pig. The pig has a pharyngeal pouch. This was news to me and has connected up with my studies on the human being. The pig in embryo has a pharyngeal pouch, which gives us a foundation for the pharyngeal pouch in man. When Dr. Dean heard of my interest in pigs, he sent me an avalanche of pigs from Iowa. In comparative anatomical studies of the pig, the ox, and man, the larynx of the pig is as large as that of the ox. In the ox it is apparently inverted. The apex has fallen down. It has a clumsy structure. In the pig it is very delicate. Animals have to swallow against gravity, so that there is a slight backward protective movement of the cartilages. In the pig the vocal cords are put in on a slant. There are true cords and false cords, and thus the pig is able to vocalize in the well known fashion.

The pharyngeal pouch in the pig appears between the thyroid and cricoid half of the inferior constrictor. In man it can appear in the inferior constrictor. In the pharynx of the pig there is a closure by musculature leading from the pharynx posteriorly to the pharyngeal pouch. A sphincter-like action will pull the arytenoids forward and the epiglottis backwards and close the muscular opening.

Embryologists have known that there is an upper pouch in man corresponding to the upper pouch in the pig. There is a lower pouch in man which appears at the same time and place as in the embryo pig and lasts for a short time. It does not change, but a small thing in embryology may make a serious difference in an adult (as, for instance, a dimple in the cheek of a baby girl), which may be very important later.

In regard to ulcer of the esophagus, in one case I got an autopsy, and split the stricture. There was an ulcer going across the esophagus, but no evidence of cancer, because there was no subepithelial infiltration.

The cases of exostoses of the cervical vertebrae occur in patients with arthritic history. In one a woman of 74 years, there was history of vomiting with intestinal upset. She had blood in the vom-

itus. The X-ray showed two short spurs on the bodies of the 5th and 6th cervical vertebrae.

Another case was in a young woman who had an exostosis of the bodies of the 6th and 7th cervical vertebrae. She complained of solid food sticking in her throat. Dr. Greene also had a case of a student, who had exostosis of the bodies of the 6th and 7th cervical. These cases call for very careful treatment. One is very near the edge of a tragedy in manipulating these cases. I thought I had something, but Dr. Forbes says he discovered an old whaler in New Bedford who had this condition.

828 Beacon Street.

AMERICAN BOARD OF OTOLARYNGOLOGY.

The American Board of Otolaryngology has arranged for two examinations during the month of April, as follows:

St. Paul's Sanitarium, Dallas, Texas, Monday, Apr. 19, at 9 A. M.

Stanford University Medical School, Clay and Webster streets, San Francisco, Cal., Tuesday, Apr. 27, at 9 A. M.

Applications may be secured from the Secretary, Dr. H. W. Loeb, 1402 South Grand boulevard, St. Louis, Mo.

TRAUMATIC PERFORATION OF THE ESOPHAGUS.

DR. HENRY BOYLAN ORTON, Newark, N. J.

The case of J. P., age 4 years, white, was admitted to the Newark City Hospital on June 9, 1924, with the history of swallowing a threaded needle.

Hereditary History: Father: age 44 years; general health good. Mother: age 33; general health good.

Antecedent Personal History: General health good. Chief illnesses: Nothing other than being a rather nervous child, of a Mongolian type. No operations, injuries or shocks.

Present History: Onset: About a half hour before admittance to the hospital, child was playing with a couple of needles. The mother could not find one and she thought probably the child had swallowed it. The child had been crying continuously since playing with them.

Physical Examination: General appearance: well developed, well nourished, 4-year-old child of Mongolian facies. Breathing dyspneic, but no cyanosis.

Child coughed slightly on admission, but cough never strenuous or constant. Apparently was not in any pain.

Head: Scalp normal.

Eyes: Pupils equal, reflexes normal, expression staring and at times startled.

Ears: Normal. Nose: Normal. Mouth: Normal. Neck: normal.

Chest: Assymmetrical, right side is better developed than left, expansion equal.

Lungs: Good resonance throughout, breath sounds clear, no rales. Some observers find breath sounds diminished on right side.

Heart: Not enlarged, sounds regular and of good quality. No murmurs.

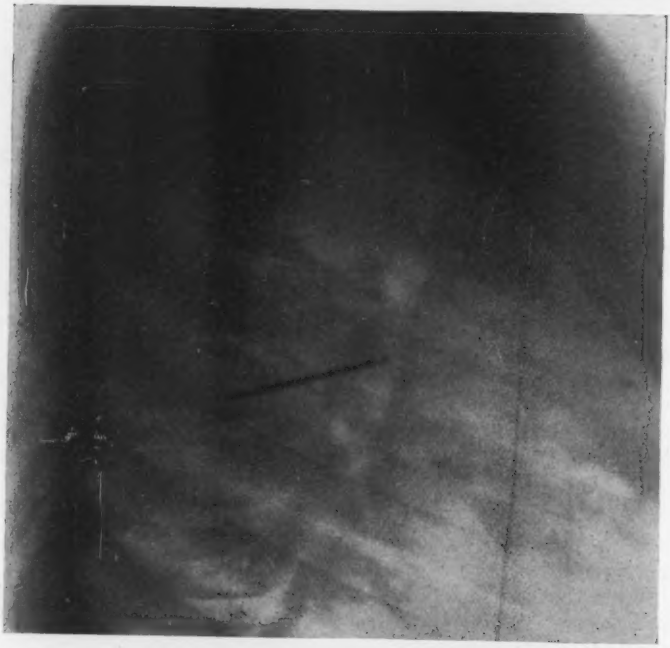
Abdomen: Will not relax. No masses felt, no area of tenderness, no viscera felt.

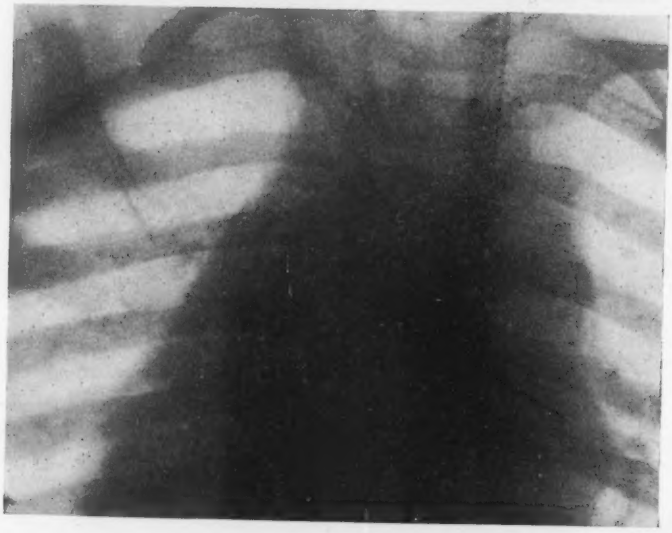
Extremities: Normal. Insists on keeping thumb in mouth.

Diagnosis: Needle in trachea or esophagus. Mongolian idiocy.

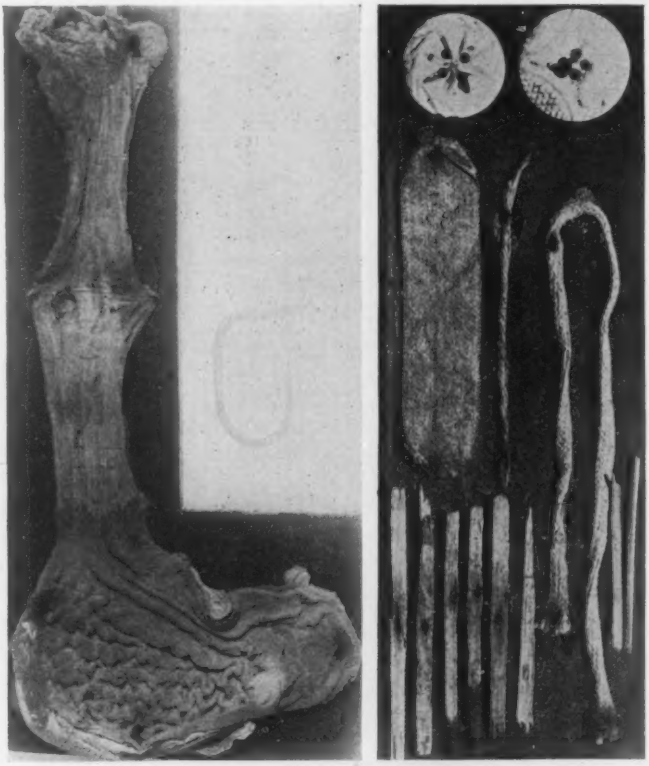
Urinalysis: Color, yellow. Transparency, cloudy. Reaction, acid. Specific gravity, 1021. Leucocytes, few (?). Epithelium, few (?). Amorphous sediments, urates.

The case was referred to Roentgenologist, Dr. Baker, who reported as follows:





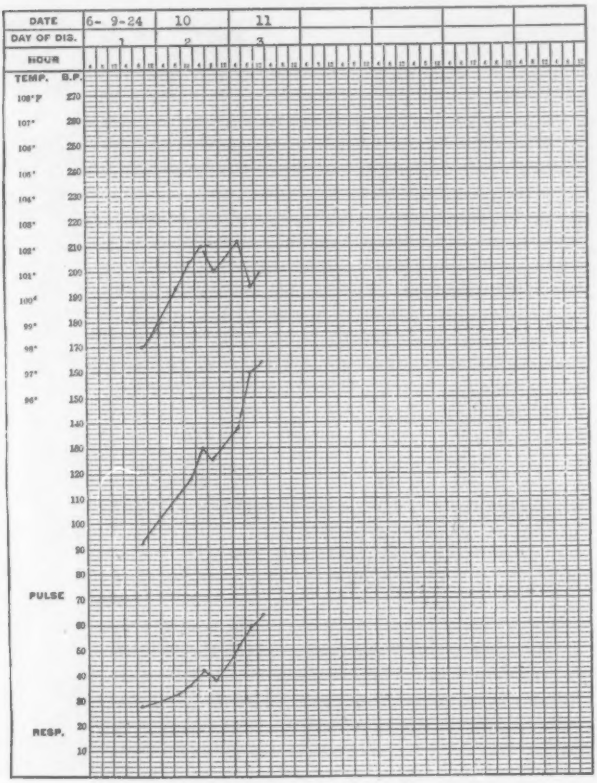
June 10, 1924: Long needle shown in both anteroposterior and lateral views, opposite 4th and 5th dorsal, probably in the esophagus. Point is downward to the right between the 5th and 6th ribs, the eye is upward to the left, over the left border of the 4th dorsal. Bifurcation of trachea and both large bronchi above the needle in anteropo-terior view and anterior to needle in the lateral view.



June 10, 1924, p. m.: The needle described in the previous report has not changed its position. From the oblique position of the needle, I believe that the needle is either in the right main bronchus or has perforated the esophagus or trachea. It is difficult to definitely locate the foreign body. There are several large buttons in

the large intestines on the right side in the region of the caecum and ascending colon and there is a small metallic foreign body on the left side in the region of the spleenic flexure.

Esophagoscopy: June 10, 1924, twenty-four hours after admittance to the hospital.



Conditions found on first endoscopy: Pus and bloody serum in the esophagus and approximately between the 4th and 5th dorsal vertebrae was seen, in the esophagus, a needle. The point had penetrated the right side; counter-pressure was made on the left lateral wall and the needle removed.

Difficulties and solution: A lot of thread, constantly interfering with the vision, was attached to the needle.

Duration of operation: 34 minutes, 5 seconds.

Result: Foreign body removed.

Dr. H. C. Barkhorn and Miss Lumbreyer assisted in the esophagoscopy.

The child was put back to bed. The next day the child was very restless, breathing labored and cyanosed, gradually getting worse, until the patient ceased breathing at 3:45 p. m., two days after swallowing the needle.

Post-mortem examination by Dr. Minningham, as follows:

Head, acute encephalitis of brain. Dr. Orton removed a 2-inch needle with piece of black thread from esophagus. There was a perforation of the esophagus with pus between esophagus and aorta. Organs were all normal except small and large intestine and rectum, which contained two large pearl buttons, six burned matches, an 8-inch piece of corset cord, a 2-inch piece of red cloth, small straw from whiskbroom, and a small piece of twine. In the small intestine there was also a 5-inch round worm.

Comments on the cases The value of a correct history being taken in all foreign body cases is obvious. In this case it was not until after the foreign body had been removed that a subsequent history from the brother revealed the fact that the child swallowed the needle with the thread attached eye first. The brother, seeing the thread hanging out of the mouth, pulled on it. It is quite evident from the position of the foreign body that the pulling of the thread caused the point to catch in the folds of the esophagus and perforated same, the needle being left in a horizontal position. The case had symptoms of mediastinitis before endoscopy.

Also whether under the conditions would it have been more discreet to have left the case alone.

671 Broad Street.

ANTERIOR DISLOCATION OF THE ATLAS AS A CAUSE FOR INABILITY TO SWALLOW SOLID FOODS.

Dr. Henry Boylan Orton, Newark, N. J.

The infrequency of this condition as a cause of difficulty in swallowing probably warrants the reporting of it.

Patient, R. A. T., age 4 years, white, was reported to me on Dec. 2, 1924, complaining of inability to swallow solid foods for the past three years.

Hereditary History: Father and mother living and well.

Antecedent Personal History: Birth was not instrumental, but mother states that there was some delay in the doctor arriving and the nurse is charged with having used force to retard the birth of the head. The child on delivery was cyanotic, with shallow breathing. Weight of baby at birth, 7 pounds. At five months, had gained only 2 pounds. Would not feed or nurse and in order to nourish the child, it was necessary to administer the milk by means of a medicine dropper. Child was eleven months old before he could sit up. Had no control of the neck and was unable to hold up his head from the time he left the hospital until he was seven or eight months old.

At the age of 3 years (one year ago) his tonsils and adenoids were removed at the Newark Eye and Ear Infirmary, with the idea of relieving the condition. There was at that time no trouble with the anesthetic. Had been under the care of a pediatrician for creatism.

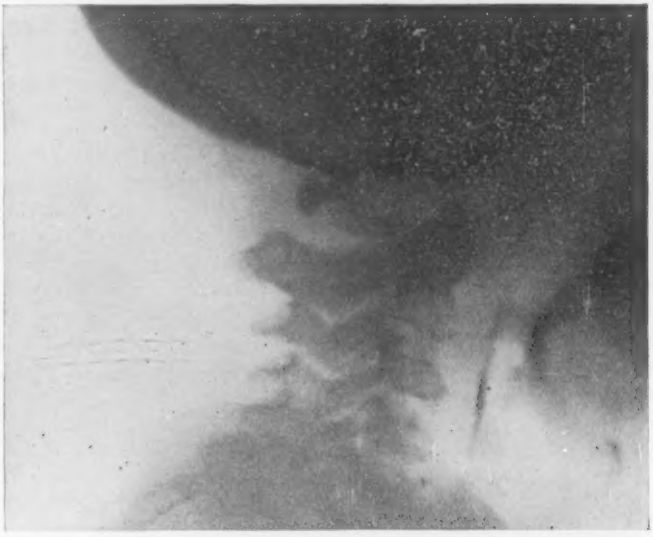
Present History: Child has a slight cough and all solid foods are regurgitated or expectorated as soon as placed in the mouth. Mother does not recall child ever having any choking spells. Sleeps on his stomach most of the time. Has constant dribbling at the mouth and excoriation of the chin.

Physical Examination: General appearance: Well developed. fairly well nourished, 4-year-old child of Mongolian facies. Head: Scalp normal. Neck: Cervical glands palpable. Eyes: Pupils equal, reacting normally. Ears: Normal. Nose: Normal. Mouth: Normal. Speech defective. Chest: Symmetrical. Lungs: Breath sounds clear. Good resonance throughout. Heart: Not enlarged, no murmurs. Sounds regular and good quality. Abdomen: Negative. Extremities: Left leg seems to be weak. Equilibrium: Unsteady.

The case was referred to the Roentgenologist, Dr. Baker, who reported as follows:

X-rays were taken with an idea of a foreign body being located or a persistent hypertrophy of the thymus gland. Examination was made of the esophagus in the usual manner, excepting that no capsule was used, it being impossible for the patient to swallow same.

Before the fluoroscope the barium was observed to pass quickly into the stomach, no evidence of obstruction being visible. The patient was then given a thick mucilaginous mixture of barium, and films were obtained showing the barium passing through the esophagus. In neither film is there evidence of obstruction, the upper portion of the esophagus being filled in a normal manner in the anteroposterior view, and the lower portion in the lateral view.



Study of the anteroposterior view fails to reveal any suggestion of persistent hypertrophy of the thymus gland. The fluoroscopic report shows nothing abnormal in the physiological functioning of the esophagus.

But on closer scrutiny of the X-ray picture, it showed an anterior dislocation of the atlas. This was further exemplified by my being able to press a tongue depressor in the mouth and getting hooked beneath the body of the atlas.

A lantern slide was forwarded to Dr. Jackson for his opinion, and both he and Dr. Manges agreed as to the dislocation.

The question is the treatment of this condition.

671 Broad Street.

PRESENTATION OF X-RAY OF AN INTERESTING ESOPHAGEAL DISTORTION.

Dr. Henry Hall Forbes, New York.

M. K., a female, age 20 years, was admitted to my service at the New York Post-Graduate Hospital and Medical School on Jan. 7, 1925, with a history of dysphagia over a period of six years. There was also present a cough with frothy expectoration and an abnormal salivary flow. Solid food could be forced down by finger in the mouth.) Fluids could be swallowed, but with difficulty. She vomited undigested food.

The X-ray report of Dr. W. H. Meyer showed that the patient had a mass in the mediastinum, due to the retention of the bismuth mixture in a dilated esophagus, with a sigmoid curve just above the cardia. On Jan. 9, 1925, esophagoscopy under general anesthetic. Owing to the collapse of the patient when attempts were made to introduce the esophagoscope, operation was abandoned. On Jan. 14, 1925, esophagoscopy. An extensive dilitation at the lower end of the esophagus. The cardiac orifice was not found, although a 28 French bougie apparently passed into the stomach. On Jan. 21, 1925, satisfactory esophagoscopy with the passage of a 30 French bougie.

On consultation it was deemed wise to open the stomach and feed the patient through the opening, giving the esophagus physiological rest. On Jan. 30, Dr. Charles Gordon Heyd performed a laparotomy. The stomach was found closely adherent to a chronically diseased gall bladder with considerable fixation of the duodenum upward and to the right. On opening the stomach, the cardiac orifice seemed to be markedly hypertrophied, with more than the usual degree of spasticity. The cardiac orifice was divulsed up to three fingers, but it was impossible to perform a retrograde esophagoscpy. However, a bougie was passed from above and a black silk thread left in situ.

The case was transferred by me, Feb. 1, 1925, to the service of Dr. Imperatori.

The case is reported for the following reasons:

1. It is the first case noted by me in which we had such a marked distortion of the esophagus accompanying a cardiospasm.

2. The pathological findings at operation, followed so closely the findings of Dr. Mosher, as a cause for the spasmotic action of the muscle at the lower end of the esophagus.

40 East 41st Street.

REPORT OF A CASE OF EMPHYSEMA OF THE NECK AND CHEST (PRE-OPERATIVE), FOLLOWING INHALATIONS OF A PIECE OF A NUT.

Dr. Henry Hall Forbes, New York.

C. O., a boy, age 2 years and 9 months, was admitted to the Babies' Ward of the New York Post-Graduate Hospital and Medical School on Jan. 3, 1925, having been referred to me by Dr. Julius Klepper.

History: Three days before admission, while eating nuts, he laughed; this was followed by a coughing attack. On day of admission he had a temperature and clinical signs of a lung condition. On Jan. 5, an X-ray by Dr. W. H. Meyer gave us the following picture. An infiltrative process extending along the roots toward the right base. An emphysematous condition of the lower right side was also noted, suggesting partial obstruction in the main bronchus. When seen by me on the same day, the child looked sick. At this time I found the condition for which I present the case—a marked subcutaneous emphysema involving the middle and both sides of the neck and extending down to the upper part of the chest anteriorly. It made me doubt the statement that no operative procedures had taken place. This is the first case of this condition coming under my notice and I wish to emphasize it as being pre-operative. The same day a bronchoscopy was performed. A 5 m.m. Jackson bronchoscope was passed, a mass seen and with the grasping forceps, three particles of nut were removed. Suction was then used and a few fragments were found in the drainage bottle. Time: fourteen minutes. Rather stormy ten days followed.

The child is now well. These cases of subcutaneous emphysema Dr. Jackson tells me have occurred in his experience. There must be a rupture of a small pulmonary vesicle with the subsequent leakage into the mediastinum and into the tissues of the neck.

40 East 41st Street.

OBSCURE CHEST CONDITIONS WITH POSITIVE BRONCHOSCOPIC FINDINGS; INCLUDING TWO CASES OF SYPHILIS OF THE TRACHEA AND BRONCHI.*

Dr. M. C. Myerson, New York.

Bronchoscopy is steadily gaining as a distinct aid in the recognition and understanding of obscure chest conditions. In this respect the bronchoscope is so recent an addition to the equipment of all those interested in lesions of the chest, that many conditions heretofore not observed, will probably be discovered in the course of time. It is fast becoming an established factor in the diagnosis, and frequently in the treatment of many conditions that have been baffling, to say the least.

The following cases are cited to demonstrate the positive value of the bronchoscope in obscure conditions of the chest. No other diagnostic agency could have secured the information which observation through the bronchoscope accomplished in these cases. In the first two cases luetic lesions were demonstrated in the tracheobronchial tree, one of these being a secondary lesion. We are told that before the days of bronchoscopy it was exceedingly difficult to recognize syphilis of the trachea and bronchi during life. Our information on the subject was gained from autopsy and from mirror examinations; some diagnoses were made on the basis of a favorable reaction to the administration of potassium iodid. The monograph of Lewis A. Conner, on syphilis of the trachea and bronchi, which was written in 1903, is probably the best reference we have on the subject. Hen analyzed 128 cases and added another. He stated that secondary lesions of the trachea and bronchi are extremely uncommon. Some are inclined to the opinion that the tracheobronchial tree frequently partakes of the same type of lesions as the pharynx and skin in the secondary stage of the disease. So far as can be ascertained, secondary syphilis of the tracheobronchial tree has not been observed bronchoscopically. The tertiary stage manifests itself in one of two forms; either as a gumma, or as an indurative fibrotic process, which by its endobronchial or peribronchial advance causes severe stenosis. Such was the case in the patient of Dr. Arrowsmith, reported a few years ago. Dr. Ornstein, who referred both these cases, says: "When a patient is referred as a case of tuberculosis, with hemoptysis, cough, expectoration and loss of weight, if he has negative physical findings, a Wassermann should be taken. If positive, evidence of lesions in the tracheobronchial tree should

*Read before the American Bronchoscopic Society, May 21, 1925.

be sought." Bronchoscopy is now indicated to attempt the localization of the suspected luetic lesion. Later the therapeutic test will substantiate the bronchoscopic findings.

Case 1: S. M., male, colored, age 28 years, was referred to the bronchoscopic clinic of the Beth Israel Hospital, Dec. 2, of last year, by Dr. Ornstein from his chest clinic at the Vanderbilt Clinic. He had been having difficulty in breathing for the past two months, with typical asthmatic breathing and frequent asthmatic attacks. He gave a history of having had a primary lesion two years before. His body was covered with a maculosquamous eruption. Two weeks after the appearance of this eruption he began to have asthmatic attacks. There was an increased anteroposterior diameter of the chest; on auscultation, sibilant and sonorous rales were to be heard throughout the chest.

On the left buccal mucosa there was a mucous plaque about the size of a 25-cent piece. There was an acute congestion and slight edema of all the pharyngeal and palate structures. The palate showed several small macular lesions. His larynx showed the same type of involvement as his pharynx.

The bronchoscopic findings were as follows: The tracheal and bronchial walls in their non-cartilaginous portions were the seat of the same type of congestion and edema as the structures just mentioned. The mucosa in the cartilaginous portions of the trachea and bronchi showed slight capillary prominences here and there, with an increased redness of the mucosa. On the anterior wall of the right main bronchus, about 15 m.m. from the bifurcation of the trachea, an irregularly cresentic white area was seen. This could not be wiped away, nor could it be removed by suction, and was identical in appearance with the mucous plaque observed on the buccal mucous membrane. The buccal plaque was observed through the same bronchoscope for comparative study; in this way the similarity of the lesions was definitely established.

The patient was placed upon antiluetic treatment, and his asthmatic symptoms immediately disappeared. Unfortunately, he disappeared when he had only received about half of his intravenous injections and recently returned, displaying a recurrence of his asthmatic symptoms.

Upon resumption treatment his asthmatic symptoms again cleared up.

Case 2: J. A., Italian, male, age 40 years, was referred by Dr. Ornstein from the Chest Department of the Vanderbilt Clinic to the service of Dr. Arrowsmith at the Kings County Hospital, for bronchoscopic study, Mar. 1, of this year. In March of last year he began to cough frequently and would occasionally expectorate

blood. He also perspired occasionally. He has since then noticed that he is weaker, that he has lost a few pounds in weight, and that exertion causes him to breathe heavily. He gave a history of having had a primary syphilitic lesion fourteen years ago. Physical examination was entirely negative. Spinal fluid examination showed a slight increase in globulin, with no other findings fo significance. The colloidal gold curve was negative. His blood Wassermann reaction was 4 plus. The Roentgen examination of his chest showed nothing abnormal or significant.

Bronchoscopic study revealed the following: On the anterior wall of the right main bronchus just beyond the carina, there is an irregular swelling of moderate degree. This area is dark red in appearance, while the remainder of the bronchus appears darker red than normal. This area of swelling is not obstructive. It measures approximately 1½ c.m. in length and 5 m.m. in width. There are two distinct white areas of ulceration, irregularly round, about 3 m.m. in diameter, and situated upon this area of swelling. In the left main bronchus, just at the carina, there is a similar small ulcer surrounded by an area of redness, situated upon the anterior wall. The diagnosis of gumma of the bronchus with beginning ulceration was rendered.

He was placed upon antiluetic treatment and was generally much improved as a result. However, he recently expectorated some blood again.

Case 3: J. S., Turkish, male, age 37 years, was referred to the Bronchoscopic Clinic of the Beth Israel Hospital by Dr. Ornstein, Jan. 6, of this year. For the past fifteen years he was experiencing shortness of breath. With this he was having cough and hemoptysis. His first hemoptysis had come four years ago. He had come to the chest clinic with a diagnosis of tuberculosis, based upon his cough, expectoration and hemoptysis. There had been no loss of weight. His temperature had not been elevated and his main cause for complaint was that he had for many years experienced a feeling of constraint in the lower chest. The blood was usually evidenced in the expectoration as a streak; while in the morning he would cough up a thick, dark red plug; and when he had a sustained coughing spell, he would expectorate bright red blood in small quantity, usually less than a teaspoonful. This latter was only occasional. For the past month blood in one or the other form as described, has been noticed daily. Physical examination revealed a total absence of breath sounds over both lower lobes. There was flatness upon percussion in these areas. Dr. Ornstein, at his clinic, was able to aspirate some purulent fluid from the pleural cavity of the right side. This fluid was not examined. No fluid could be obtained from the left side at this time. Repeated Wassermann tests in different laboratories

were reported back negative. The Roentgen examinations seemed to indicate pleural effusion in each side of the chest.

He was referred for bronchoscopy, because it was thought that he might have some bronchial lesion to account for the loss of aeration of his lower lobes. He was bronchoscoped three times, several weeks apart.

The bronchoscopic picture was as follows:

Right side: The posterior branch of the lower lobe bronchus was entirely occluded by a peculiar jelly-like tumefaction of the mucous membrane. The obstruction was complete. The anterior branch was free from involvement.

Left side: The mucosa at the introitus of the lower lobe bronchus shows the same jelly-like tumefaction. This bronchus is obstructed entirely. Solution of adrenalin introduced through the bronchoscope caused an immediate disappearance of the tumefaction in the primary branches, but a similar jelly-like image was to be seen in the bronchial branches beyond. This would indicate that all the branches of the left lower lobe bronchus and of the right lower lobe bronchus posteriorly, were similarly involved. It was evident that this tumefaction was interfering with the flow of air to and from the lower lobes of the lung.

To the writer this bronchoscopic picture was an unusual one, and opinion was therefore withheld until the case could be further studied. His chest was again aspirated. This time a purulent fluid was removed from each pleural cavity. Cultures showed no growth. On the left side the needle encountered a stiff resistant wall, and a definite scratching sound was elicited. A diagnosis was accordingly made of sterile pus in the pleural cavities with calcification of the pleura on the left side and also probably the right.

This patient has evidently had sterile pus in his pleural cavities, with calcification of his pleurae, for many years. The bronchoscopic picture could now be explained as indicating passive congestion due to pressure. Although the bronchoscope did not make a diagnosis in this case, the bronchoscopic picture is sufficiently rare, and at the same time sufficiently positive and definite to warrant its being recorded.

Case 4: F. R., Pole, age 64 years, was seen on the service of Dr. Arrowsmith at the Kings County Hospital, Nov. 10, of last year. His chief complaint was shortness of breath. For the past five years he had been suffering with shortness of breath, which had become more marked recently. On and off during this time he had had a cough, which was nonproductive. There had been no hemoptysis and no loss of weight. He had had pneumonia fifteen years ago.

Physical examination revealed an area of percussion dullness in the left upper chest extending about 8 c.m. to the left of the sternal border, and extending down to the third rib. Sibilant and sonorous rales were heard throughout the left chest, with some slight interference with the transmission of breath sounds in the area of dullness just mentioned. On the right side sibilant and sonorous rales were also heard, but were not so marked. Here the breath sounds are nearer normal. There was slight dullness on percussion of both apices posteriorly. Opinions varied, and the following conditions were represented .by the different internists who examined the patient : Asthma, neoplasm of the mediastinum, aneurysm and tuberculosis. Roentgen examination confirmed the impression of tumor of the mediastinum.

The patient was bronchoscoped; a cauliflower mass, the size of a small walnut, was seen protruding from the superior wall of the left main bronchus at the point of entrance of the lower lobe bronchus. A section was removed and sent to the laboratory. The report came back: squamous cell carcinoma. This neoplasm originated in one of the upper lobe bronchial branches and extended down through the main bronchial wall. The diagnosis was immediately cleared up with the passage of the bronchoscope.

30 East 40th Street.

PHANTOM FOREIGN BODY OF THE LARYNX.*

DR. M. C. MYERSON,* New York.

There have without doubt been some instances in the experience of bronchoscopists where an area of calcification, or some superimposed structure has given the false impression on the Roentgen film of an actual existing condition in the air passages. Such is the type of case which is here presented.

B. C., female, age 31 years, was seen at the E. New York Hospital, Dec. 5 of last year. She had had some degree of hoarseness and a croup-like cough at intervals during the past five years. When seen she was suffering with laryngeal spasm and dyspnea in addition to her other previous symptoms; this had been so particularly for the past ten days. Indirect laryngoscopy revealed nothing defintie, except that there was what appeared to be an abnormal bulge just below the anterior commissure.

Nasal examination disclosed both chambers fairly full of moderate sized polypi. Her general physical examination and examination of her chest were negative.

*Presented before the American Bronchoscopic Society, May 21, 1925.
*From Department Otolaryngology, E. N. Y. Hospital. Service of Dr. S. J. Kopetzky.

Roentgen examination of her laryngeal and upper tracheal region revealed a shadow, which was interpreted as that of a bone collar button. The idea immediately occurred that our patient had been carrying a collar button in her larynx for several years.

She was accordingly laryngoscoped. No foreign body was to be seen. She was bronchoscoped to see whether the body had dropped down, but this too produced negative results. She was again X-rayed. The same shadow of a collar button was to be seen. Laryngoscopy and bronchoscopy were again performed, and when no foreign body was found, the idea of an area of calcification in the thyroid cartilage was expressed by one of the Roentgenologists. Roentgen examination of the neck in a different position than that used the first two times, did not show the collar button shadow.

After this her nasal condition received attention; the polypi were removed and her ethmoid regions cleaned out. Her laryngeal spasm,

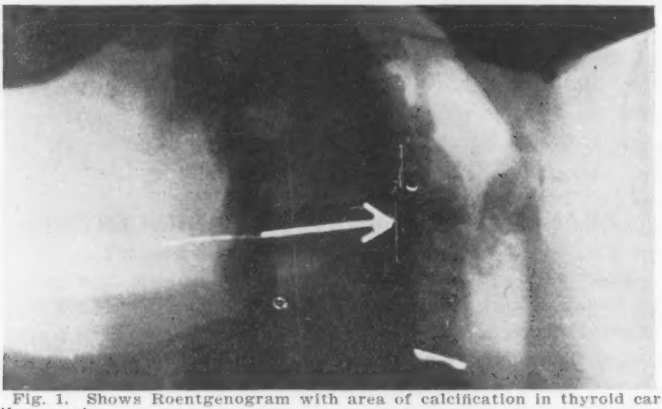


Fig. 1. Shows Roentgenogram with area of calcification in thyroid cartilage region.
Fig. 2. Shows the same, touched up, so as to bring out calcified area.

cough and dyspnea began to disappear with the removal of her nasal pathology, and within three or four weeks she was perfectly well and free from her laryngeal symptoms.

This case demonstrates two practical points. First, that in cartilaginous structures, we may encounter areas of calcification which simulate foreign bodies. Second, that chronic suppurative nasal disease predisposes to, and at times causes, severe laryngeal symptoms and pathology. In this case there was no evidence of pathologic change in the larynx.

30 E. 40th Street.

A HISTORY CHART FOR THE BRONCHOSCOPIC CLINIC.

As Used at Manhattan Eye, Ear and Throat Hospital, New York.

Presented by Dr. Charles J. Imperatori, New York.

BRONCHOSCOPIC CLINIC
MANHATTAN EYE, EAR AND THROAT HOSPITAL
Dr C. J. Imperatori
Director
Associates
Dr. Lewis
Dr. Smith
Dr. Hilton
Clinic No. Date Case No.
Provisional Diagnosis Name
Final Diagnosis Address
Age Sex M. S. W. Occupation
Referred by
STATUS PRAESENS
VOICE CHANGES
Duration
Character
Influenced by
RESPIRATORY
1. Cough
2. Dyspnoea
3. Cyanosis
4. Expectoration
PREVIOUS HISTORY and PRESENT ILLNESS
PAINS
Character
Location
Referred to
Duration
Influenced by
DEGLUTITORY
Dysphagia
Aphagia
CLINICAL MISCELLANY
Teeth
Tonsils
Gland
Anemia
Cachexia
Diabetes
X-RAY REPORTS
LABORATORY REPORTS
1. Tissue
2. Sputum
3. Blood
4. Miscellany
REPORT OF OPERATION
Procedure
Date
Anesthetic
Conditions found on Endoscopy
Diagnosis
If foreign body—character
Length of time in situ
Location
Duration of operation
Result
Post operative Roentgenogram
Remarks
Date
Treatment Notes
Continued on next

FOREIGN BODY INTRODUCED TRANSPLEURALLY AND REMOVED VIA BRONCHUS THREE YEARS LATER.

DR. CHARLES J. IMPERATORI, New York.

J. M. D., age 33 years, was admitted to a General hospital in New York City in the early part of 1921. He had an empyema of the left chest and a thoracotomy was done with a rib resection. A drainage tube was inserted and in its gauze packing was introduced.

This wound drained for about a year, but finally healed. In the latter part of 1922 the wound broke down and a small piece of gauze was removed.

In December, 1923, the patient began to cough and expectorate from 2 to 4 ounces, daily, of a very foul-smelling material. Once on examination of the sputum the patient discovered several threads of gauze.

By the middle of April, 1924, he had lost considerable weight and strength and was coughing severely.

He was first seen at the New York Post-Graduate Hospital, where a radiograph of his chest was taken. A report from Dr. Meyers, the radiographer, was that there was a possibility of a foreign body, being present in the center of the infiltration in and around the lower part of the left lower lobe.

On Apr. 26, 1924, a bronchoscopy was done under local anesthesia and after examination of the left main bronchus the first ventral branch of the lower lobe was entered and on inspiration, about 1 c.m. from its origin, a small nipple-appearing foreign body was seen in a bronchial subdivision, extending laterally.

With a straight forceps, the foreign body was seized and gentle traction made, for some bleeding was anticipated.

The foreign body seemed to be of great length and gave one the sensation, many times minimized, of pulling a large fish out of the water.

On completing the extraction, the foreign body was found to be a piece of gauze packing about 8 inches long.

This was undoubtedly the piece of gauze packing that was noted on the operating chart, and placed within the drainage tube, at the time of the thoracotomy in January, 1921.

There was very little bleeding.

The only explanation possible of the entrance of the foreign body into the bronchus is that it originally must have been pushed into the pulmonary tissue and gradually migrated to the bronchus.

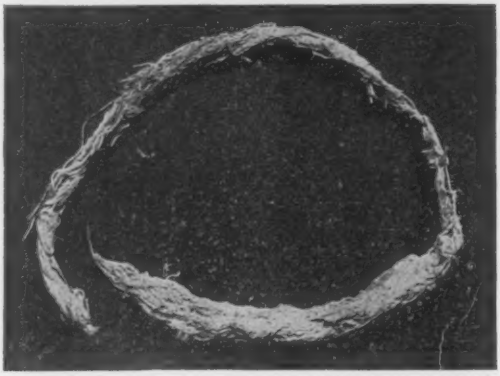


Fig. 1. Foreign body. Eight inches of gauze packing.

Fig. 2. Endoscopic appearance of end of foreign body, extruding from bronchus.

Since the extraction, the patient has stopped coughing and expectorating, and has gained 20 pounds in weight.

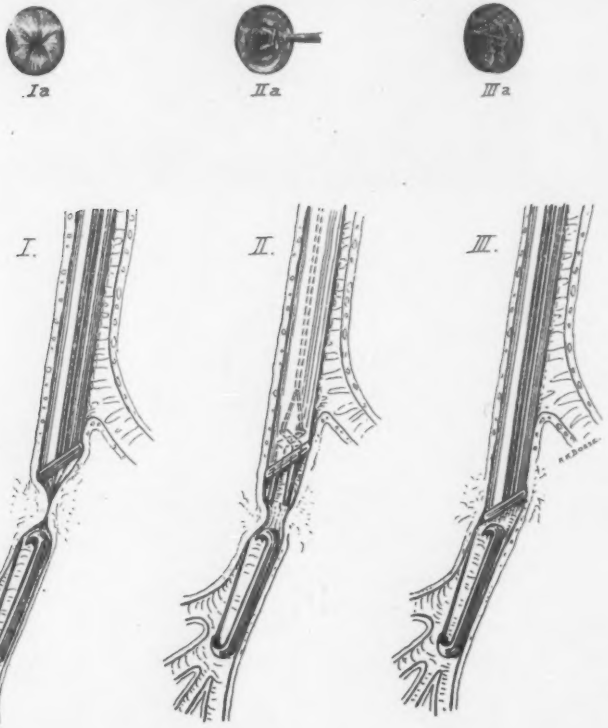
He reported about a week ago that he has had no further symptoms, it now being over a year since removal of the foreign body.

FOREIGN BODY REMOVED FROM THE BRONCHUS AFTER BEING IN SITU OVER THREE YEARS.

DR. CHARLES J. IMPERATORI, New York.

A. S., age 10 years, gave a rather indefinite history of cough and mucopurulent expectoration for the past three years.

He gave no history of having inspirated a foreign body and it was only after visiting the Tuberculosis Clinic of the Lincoln Hospital,



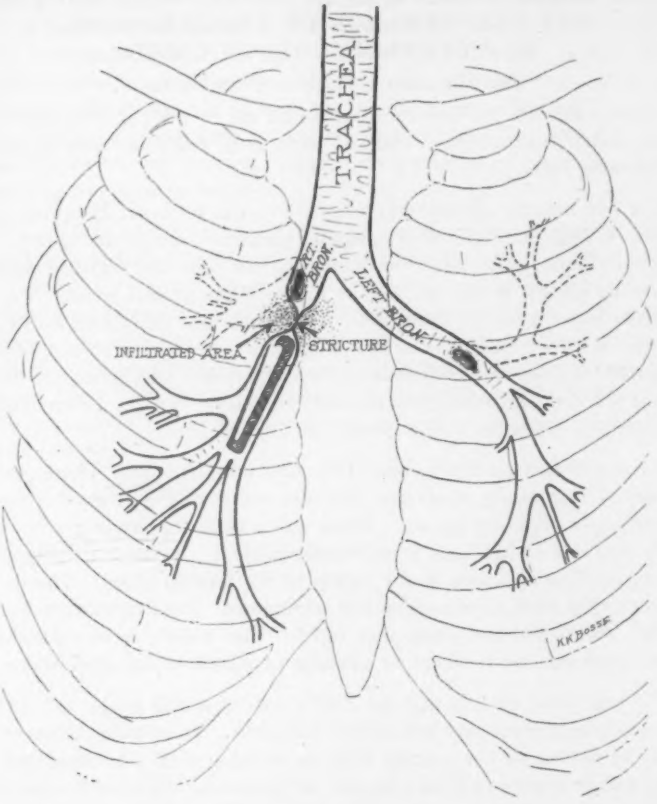
I and Ia showing bronchoscope in the right bronchus and endoscopic appearance of the bronchus.

II and IIa showing dilatation of stricture through the bronchoscope, using the Jackson bronchial dilator.

III and IIIa showing appearance of foreign body after dilatation of stricture.

New York City, that a radiograph showed the presence of a large bar pin in his right bronchus.

The illustrations are self-explanatory, excepting the method of extraction, which was comparatively easy after the dilatation of the



IV. Out line of reconstructed radiograph, showing stricture of the right bronchus above the foreign body.

stricture. As the child was very difficult to control, a general anesthesia was used.

The extracting forceps used was a Tucker tack forceps and the pin was successfully closed and withdrawn through the bronchoscope.

The child has made an uneventful recovery.

THE BRONCHOSCOPE AS AN INVALUABLE AID FOR THE PERFORMANCE OF TRACHEOTOMY IN A CERTAIN CLASS OF CASES.

Dr. Fielding O. Lewis, Philadelphia,

The value of the bronchoscope as an aid in the performance of tracheotomy on a certain class of patients is well illustrated by the following case.

A five months old boy was admitted to the Jefferson Hospital on Mar. 4, 1924, with alarming signs and symptoms of obstructive laryngeal dyspnea. The history revealed that the child had suffered with swollen glands on the left side of the neck for several weeks. External incision for the evacuation of pus had been performed on two occasions before being admitted to hospital. Being unable to nurse, he had been fed small quantities of milk by means of a spoon for the past few days, breathing was labored and noisy. He was restless and could only sleep for a few minutes at a time.

Examination on admission: The child was cyanotic. There was marked respiratory dyspnea. He was septic and exhausted from many hours fighting for air. There was a large suppurating area in the left side of the neck from recent incisions. A large and rather firm swelling was seen in the region of the thyroid gland. The tissues of the neck were swollen and edematous. The temperature was 102° rectal and the pulse was rapid. The tonsils were enlarged but there was no evidence of swelling or edema in the oropharynx.

It was quite evident that the child's condition was grave and that immediate tracheotomy was clearly indicated. To operate, however, on the patient of five months with the existing local manifestations, the tissues apparenly filled with pus, all landmarks obliterated, seemed to me a hazardous procedure. It was, therefore, decided to attempt the passage of a bronchoscope in order to inspect the interior of the larynx and to temporarily relieve the laryngeal stenosis. Accordingly, Dr. Clerf, using a 4 m.m. tube, found the epiglottis, left aryepiglottic fold and the left arytenoid were swollen as a result of inflammation and edema so that the cords and glottic chink could not be seen by direct laryngoscope. The bronchoscope was then passed with some difficulty through this swollen area. The vocal cords were slightly inflamed, the tracheal lumen was swollen and com-

pressed from the left side. A large quantity of thick secretion was found in the trachea which was removed by means of the aspirating tube. The breathing at once improved and the cyanosis became less.

With the bronchoscope in position, the otherwise uncertain and dangerous emergency operation became an orderly procedure. Plenty of time was utilized in the evacuation of the pus before the opening was made in the trachea. The trachea was easily visible, the light from the bronchoscope showing the tracheal rings clearly, which made it possible to do a low tracheotomy. The child, after three stormy weeks with careful nursing and two life-saving bronchoscopies for the removal of inspissated mucous at the cornia, has made a complete recovery.

As I look back over some cases of carcinomatous glands of the neck in which the trachea was pushed from its normal position and involving the thyroid gland, I can see how much easier a bronchoscope would have aided the very difficult operation. This has been done by members of Dr. Jackson's staff with comparative ease and safety. Other conditions, such as an enlarged thymus or extremely large thyroids, producing symptoms of laryngeal dyspnea from pressure, could in my opinion be better and easier tracheotomized by this method.

259 S. 17th Street.

FOREIGN BODIES IN THE TRACHEOBRONCHIAL TREE. REPORT OF CASES IN WHICH BRONCHOSCOPY WAS NOT DONE.*

DR. LOUIS H. CLERF, Philadelphia.

Coughing up of a foreign body from the trachea or bronchus is a very fortunate occurrence and constitutes the best spontaneous solution of any case of foreign body in the lung. Although a fortunate outcome in the individual case, it, unfortunately, tends to give rise to the erroneous belief that bronchoscopic removal of a foreign body should be deferred with the hope and expectation that the intruder would be ejected with the aid of natural forces.

The earlier writers on this subject recognized some of the dangers incident to delaying the then recognized methods of foreign body removal. Sir Benjamin Brodie[1] "strongly advises not to trust to nature. The foreign body may be coughed up through the glottis, but it may stick in the glottis and the patient die." U. P. Thornton[2] states that "there is but little hope that by waiting the substance will be coughed up. The plan of inverting the body, so successful in Brunel's case (Brodie's case of half sovereign in the trachea) is to be regarded as a dangerous measure because the foreign body, as, for instance, a coin, might get changed from a perpendicular to a transverse or horizontal position, so that the patient would then very quickly become suffocated." Gross observes that he has "known a number of children lost in the vain hope that extrusion might occur spontaneously."

These statements are of interest since they represent the thought of some of the leaders in medicine during the prebronchoscopic period and at a time when the commonly accepted operative treatment of foreign bodies in the air passages was tracheotomy, combined with blind methods of instrumentation through the tracheal fistula. Inversion of the patient, a plan of treatment which Gross states "has probably been practiced from time immemorial," is wisely discouraged.

Statistics bearing on the spontaneous expulsion of foreign bodies are misleading and are practically without value. It is impossible to determine accurately the number of cases in which there has been foreign body aspiration; also the number of cases where the intruder has been successfully expelled. There is no record of the fatal

*From the Bronchoscopic Clinic, Philadelphia, Pa.

cases where the foreign body lodged in the glottis during a paroxysm of coughing; yet all of us have frequntly read newspaper accounts of these tragedies. Too often the exact location of the expelled substance was unknown. Manifestly, a foreign body in the larynx is more readily coughed up than one which is lodged in the smaller bronchi.

In the early literature of tracheobronchial foreign bodies, the reports of foreign bodies having been coughed up are relatively common. Howship[3] reported a case of an iron nail, seven-eighths of an inch long, lodged in a small bronchus, which was successfully coughed up after a sojourn of four months.

Lettsom[4] reported the expectoration of a button after a sojourn of seven months, with recovery.

Craige[5] reported a patient who coughed up a tooth two years after its aspiration.

Ticknor[6] reports the case of a man, age 63 years, who coughed up a bone which was aspirated when he was three years of age. Many other cases of spontaneous expulsion are recorded and these constitute a considerable proportion of the total number of foreign body cases then observed.

It must be recalled that the Roentgen ray and the bronchoscope were then unknown; also that the symptomatology and clinical diagnosis of foreign bodies in the air passages had not attained that degree of perfection which it now enjoys. The chief means of diagnosis then were the spontaneous expulsion of the foreign substance, the findings at autopsy and, in a limited number, conclusions based on the history, symptoms and clinical findings. This fact is well borne out by the statistics furnished by Weist,[7] who in 1883 reported a series of 1,000 cases collected by him from original sources. Of these, 460 cases, or 46 per cent, terminated by spontaneous expulsion and recovery. Incidentally, of the 1,000 foreign bodies, 520 were of vegetal origin.

At the present time when the diagnosis of a foreign body can be positively made and accurately localized by clinical findings, by Roentgenology and by bronchoscopy, without the assistance of spontaneity or of autopical data, we find that cases of spontaneous expulsion are uncommon. Chevalier Jackson places the number at 2 to 3 per cent.

The relative infrequency of such an outcome is dependent on a number of factors, which shall be considered.

Anatomic and physiologic considerations: Unlike a straight and rigid tube, the tracheobronchial tree with its many branches, its

turns and bends, constitutes a devious passageway, the entrance of which is narrowed by the glottic chink. On inspiration the bronchi dilate and elongate, while on expiration they shorten and contract. These movements are greatly accentuated during cough. On inspiration there is a maximum widening of the glottic chink, while on expiration it is only partially open; during cough it temporarily closes and then suddenly opens, but never to its maximum limits. There are certain reflexes active in the trachea which when excited by any foreign substance induce immediate closure of the glottis.

Fig. 1. Roentgenogram made by Dr. W. F. Manges in the case of a young woman 24 years of age, about one hour after she had accidentally aspirated a common pin. It was localized in the right lower lobe bronchus. About two hours after the accident she had a paroxysm of coughing and expectorated the pin.

The force of the column of air during inspiration is not nearly so great as that imparted by an expulsive effort during coughing.

Another force which must be taken into consideration is gravity. With the body in the erect position this undoubtedly exerts an influence on foreign bodies in the air passages by contributing to their downward progress into the smaller bronchi. This fact led to inversion of the patient so that it might fall out, and also accounts for patients with loose foreign bodies in the trachea, sitting up rather than assuming a recumbent position.

The chances for coughing up a foreign body depend very largely upon its nature and upon the influence exerted on it by the factors found in the airway and by gravity. Theoretically, a sharp-pointed foreign body, as a pin, needle or dental brooch, should never be coughed up. Such an object is invariably found, point uppermost, in the smaller bronchi, reaching that position partly by gravity, but probably more so because of the ratchet-like mechanism of the point which resists any other movement than downward.. To be success-

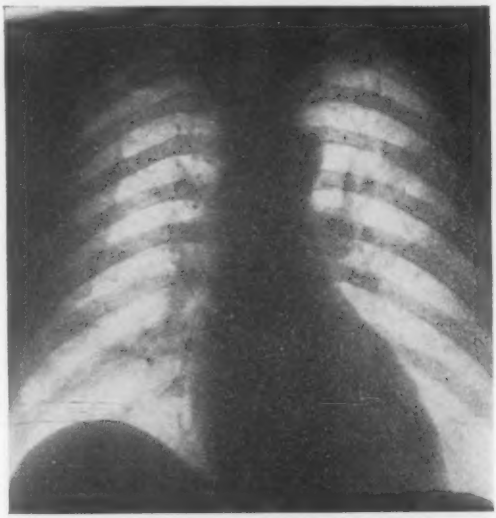


Fig. 2. Roentgenogram of a patient, aged 53 years, with a dental canal reamer, handle downward, in the right stem bronchus. He was referred to the Bronchoscopic Clinic for bronchoscopy. On the second day after the accidental aspiration he had a paroxysm of coughing and felt something in his throat. Roentgenrays taken shortly afterward by Dr. W. F. Manges failed to reveal the foreign body anywhere in the air or food passages.

fully coughed up it must travel with its long axis in the long axis of the airway, avoiding all the angles as well as the subglottic tissues. The natural tendency for a foreign body of this type is to travel with the heavier extremity, the head end, foremost. Being found more often point upper most in the bronchi, it would, if coughed up, attempt to turn spontaneously, a feat practically impossible because of insufficient space in the airway. More often the point will be found embedded in the tracheal wall or as occurred in Fletcher's case[8] the foreign body, a glass-headed pin, previously

localized by Roentgen ray in the dorsal branch of the right bronchus, was found in the trachea with its point embedded in the undersurface of the left vocal cord. These bodies offer but little surface to the force of the expiratory blast.

In spite of these considerations several cases of bechic expulsion of slender, pointed foreign bodies have occurred under peculiar circumstances.

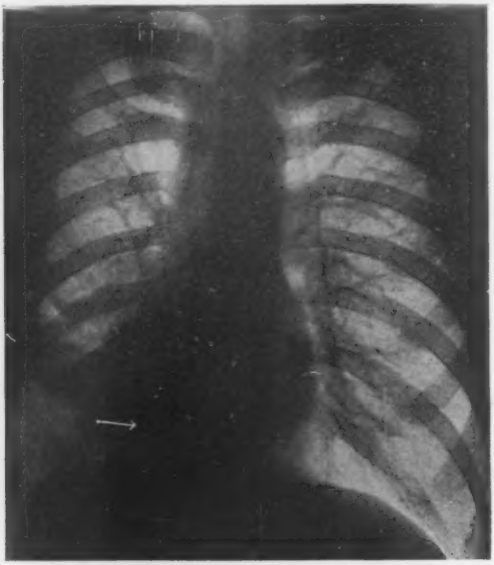


Fig. 3. Metallic tooth filling in the right lower lobe bronchus of a man aged 44 years. It was lost during an extraction under nitrous oxide gas anesthesia and was not missed. The patient became ill and was successively treated for grippe, bronchitis, pneumonia and lung abscess. At exploratory thoracotomy the right lower lobe revealed unusual pathology. Roentgen ray studies showed a foreign body shadow in the right lower lobe. The patient was referred to the Bronchoscopic Clinic, where the diagnosis was verified by Dr. W. F. Manges. A diagnostic broncoscopy was arranged for, but the foreign body was coughed up one hour before the time scheduled

Case Reports: E. W., age 24 years, stenographer, coughed up a common pin which had been localized in the right lower lobe bronchus (Fig. 1).

M. S., age 12 years, aspirated a common pin. Dr. Louis West, of Raleigh, N. C., who localized the pin by Reontgen ray study in the lower part of the left lung, sent the child to the Bronchoscopic

Clinic. About twenty-one hours after the accident, when within 20 miles of Philadelphia, the pin was suddenly coughed up.

M. B., age 10 years, aspirated a shawl pin, which was localized point uppermost in the left lower lobe bronchus. She was subsequently referred to Dr. G. C. Carroll, of Rochester, N. Y., for bronchoscopy. While being transported from her room to the operating room she coughed and felt a sticking sensation in her throat, which disappeared on swallowing. An X-ray examination was made and the pin found in the stomach. It was passed by bowel in about

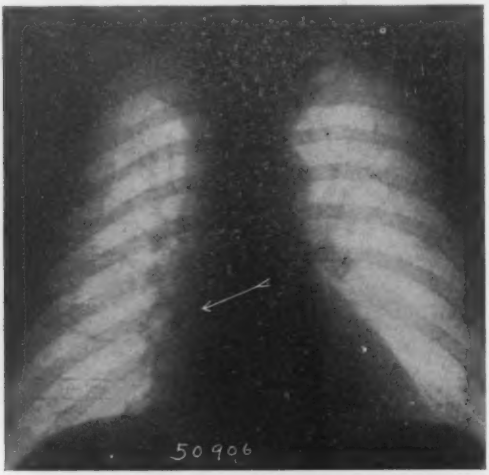


Fig. 4. Roentgenogram in case of a man, aged 51 years, who accidentally aspirated a gold tooth filling, which was subsequently localized in the right stem bronchus by Dr W. F. Manges. A diagnostic bronchoscopy was decided on. While the nurse was preparing to give a hypodermic injection of morphin sulphate one hour before the scheduled bronchoscopy the patient had a paroxysm of coughing and expectorated the filling.

seventy-two hours. The pin measured 4¾ c.m. in length, the glass head being 5 m.m. in diameter (personal communication).

D. J. M., age 53 years, accidentally aspirated a dental canal reamer, which lodged in the right lung (Fig. 2). It was successfully coughed up the second day after the accident.

Heavy foreign bodies, as bullets, ball bearings, and other portions of metal, tend to seek the more dependant portions of the air passages. They present a small surface relatively to their weight, so that the force of the expiratory blast is not sufficient to expel the intruder. If, in addition, these bodies are smooth and rounded they

fit tightly into a bronchus, often completely corking it. With absorption of the air distal to the corked lumen, a negative pressure is applied to the foreign body which tends to pull it more tightly into the bronchus. Coincident with this there is edema of the bronchial mucosa, producing a ring-like constriction proximal to the foreign body. Under such conditions enough air for an expulsive effort cannot be drawn beyond the foreign body.

Exceptions, however, are observed as in the case of E. L. F., age 44 years, who aspirated a metallic tooth filling (Fig. 3), which was overlooked for three months. It was spontaneously expelled one hour before a scheduled bronchoscopy.

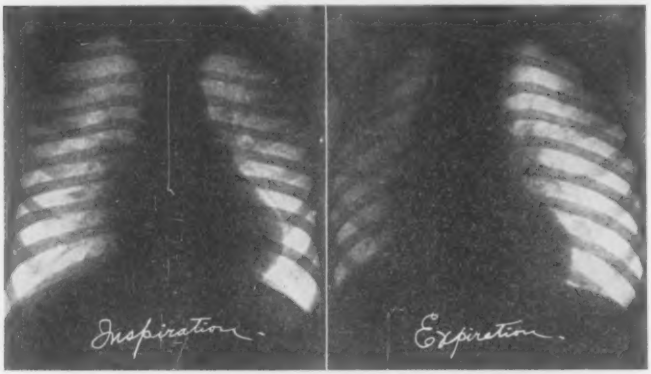


Fig. 5. Roentgenograms of the chest made by Dr. W. F. Manges at the end of inspiration and expiration in the case of a boy, 8 years of age, who choked on a piece of apple. Dr. Manges reported that there was very positive evidence of obstructive emphysema of the left lung, indicating the presence of a non-opaque foreign body in the left main bronchus. This was corroborated by the findings on physical examination. The foreign body was coughed up during the night. The Roentgen ray studies and physical findings made on the following day showed that there was no interference to air entering the lungs.

N. H. S., male, age 51 years, coughed up a tooth filling from the right stem bronchus while the nurse was preparing a hypodermic syringe to give a sedative preliminary to the diagnostic bronchoscopy (Fig. 4).

It is interesting to note that this man developed a bilateral pneumonia about three months afterwards. The fatal termination of the case, brought up the question of the foreign body aspiration as an etiological factor. That the pneumonia was a purely intercurrent matter was undeniable.

Teeth and other irregular foreign bodies of intermediate specific gravity are occasionally coughed up. As in the case of rounded

metallic substances, these bodies more often gravitate into the smaller branches of the bronchi and are accompanied by considerable pathology because of the bronchial obstruction which they produce.

Vegetal foreign bodies, more than any other group, are often found in the trachea and also are the most dangerous, especially in children, because of their tendency to lodge in the inflammatory glottis and subglottic space, causing asphyxiation. Successful spontaneous expulsion of these substances is uncommon, due, probably

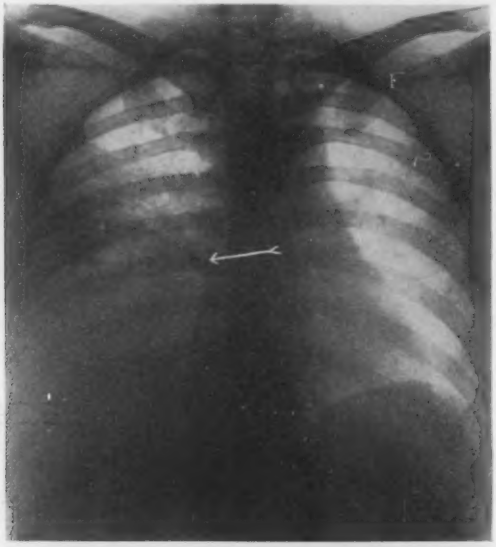


Fig. 6. Roentgenogram by Dr. W. F. Manges of a woman, age 43 years, showing a foreign body (tooth) in the right stem bronchus and very extensive pathology in the right lower and middle lobes. There was a history of extraction of 19 teeth under nitrous oxide anesthesia three weeks before. On arrival at the Bronchoscopic Clinic the patient was practically moribund. Dr. T. McCrae, who examined the patient, believed that there was extensive gangrene of the right lung. Bronchoscopy was believed inadvisable at this time because of the patient's critical condition. She became steadily worse and finally succumbed; however, just before death she coughed up a large quantity of very fetid pus with the offending tooth. At autopsy there was found extensive gangrene of the middle and right lower lobes.

to the swollen glottis, the presence of a large quantity of secretion from the septic bronchitis and the laryngeal spasm.

Successful bechic expulsion occurred in the case of a boy, age 11 years, who choked while eating peanuts. On admission to the Bronchoscopic Clinic there were found the characteristic signs of

tracheal foreign body. Shortly after, during a severe paroxysm of coughing, he coughed up a large portion of peanut.

Spontaneous coughing up of peanut fragments in the case of small children does not always relieve the signs or symptoms of foreign body in the bronchus. Ellen J. Patterson[9] reports several interesting cases of children in whom a diagnosis of peanut in the bronchus had been made. Although the foreign bodies undoubtedly had been expelled spontaneously, bronchoscopy was necessary to remove

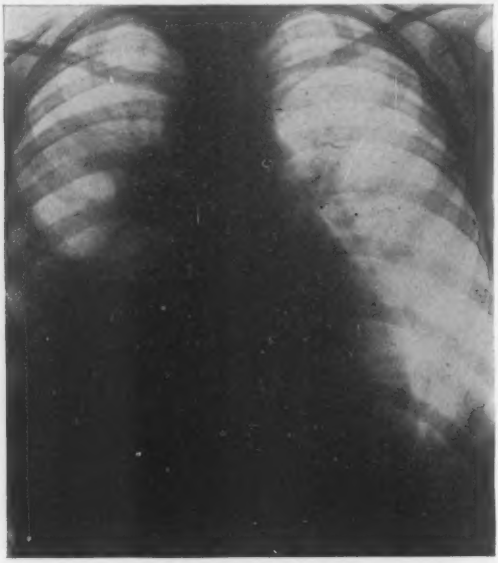


Fig. 7. Roentgenogram of a child, age 6 years, who aspirated a timothy head. It was believed that the foreign substance would be coughed up. After two months a right-sided empyema developed, which required thoracotomy. On admission to the Bronchoscopic Clinic, ten months after the accident, the child was very ill. Dr. W. F. Manges reported by Roentgen ray study that there were two large abscess cavities present involving the middle and right lower lobes. Several days after admission, before the X-ray studies were completed, the patient coughed up a timothy head 4 c.m. in length. He eventually made a complete recovery, although there was very extensive fibrosis of the involved lung.

the purulent secretion which the patients were unable to expectorate and which persisted in keeping up the physical signs.

Particles of food which soften and disintegrate rapidly are occasionally coughed up, as was observed in the case of a boy, H. G., age 8 years, who choked while eating a portion of an apple. Dr. Richard S. Magee, of Altoona, Pa., made a diagnosis of foreign body

in the left bronchus and referred the patient to the Bronchoscopic Clinic. The diagnosis was verified by Dr. W. F. Manges (Fig. 5). The foreign body was coughed up shortly after admission to the hospital.

In cases of foreign bodies of prolonged sojourn the usual formation of extensive fibrosis with strictures or of granulations prevents their bechic expulsion. J. W. Jervey[10] reports the case of a boy, age 8 years, with a carpet tack in the right stem bronchus of several months duration. A diagnostic bronchoscopy revealed the tack, point up, with the head so firmly embedded and hidden by granulations that it resisted moderate traction with forceps. The case was referred to Dr. Chevalier Jackson, who reported that the tack had changed its position and was then in the left main bronchus. Bronchoscopy was done with negative results and the tack was localized in the intestinal tract.

In other cases associated with extensive suppuration, the foreign object may be coughed out along with a large accumulation of pus, suddenly liberated from beyond the foreign body. This occurred in the case of a woman, L. T., age 43 years, who was admitted to the Jefferson Hospital in a moribund condition, with the history of having aspirated a tooth three weeks previously. Bronchoscopy was not done because of her critical condition. The case terminated fatally, but just before death the tooth, along with a large quantity of pus, was coughed up (Fig. 6).

Another interesting foreign body case of long sojourn was that of J. K., age 6 years, who had aspirated a timothy head ten months before admission. There was extensive lung suppuration and he was critically ill. Fortunately he coughed up the timothy head shortly after admission and made a complete recovery (Fig. 7).

Summing up briefly, it can be stated that there are many anatomic and physiologic factors which interfere with spontaneous bechic expulsion.

Gravity favors the retention of the foreign body unless the patient is inverted, an exceedingly dangerous procedure.

The expectorating mechanism in children is highly inefficient as compared to its effectiveness in adults.

Certain foreign bodies are more readily coughed up than others. Those of high specific gravity[11] are rarely expectorated in adults and practically never in children. Objects with a low specific gravity are occasionally expelled in adults and in children, while coughing up of those of an intermediate specific gravity is exceedingly remote.

CONCLUSIONS.

1. The chances of spontaneous expulsion of a tracheobronchial foreign body with recovery of the patient are at best not more than 3 per cent.

2 So long as the foreign body remains in the air passages there is: a progressive increase in the pathologic processes; danger of complications; an increase in the difficulties attending the removal of the foreign body; and in certain cases the ever-present danger of asphyxiation.

3. Careful bronchoscopy for tracheobronchial foreign bodies gives over 98 per cent of successful removal with recovery.

4. Under such conditions it is fair to assume that no well informed person would advise waiting with the vain hope that the intruder will be spontaneously coughed up.

5. After rather extensive study of this subject the views arrived at confirm those of Chevalier Jackson and in advising patients or the family it would be well to recall his dictum,[12] which applies with as much force today as it did when first stated, namely:

"We do full justice to our patients when we tell them that while the foreign body may be coughed up, it is very dangerous to wait; and, further, that the difficulty of removal increases with each hour the body is allowed to remain."

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128 S. 10th Street.

SURGICAL DIATHERMY FOR TUMORS OF THE TRACHEA.

DR. HARRY H. BOWING AND DR. PORTER P. VINSON,
Rochester, Minn.

Tumors of the trachea are usually malignant, and treatment is, of course, only palliative. However, any form of treatment that will reduce the size of the growth even temporarily and permit free respiration is well worth while, and therefore we record our experience with surgical diathermy for the partial removal of one of these unusual lesions.

For the effective application of this electrical treatment, the lesion must be localized and accessible. In the case presented here, we were fairly certain that the lesion was localized, but it was only partly accessible. All possible methods of treatment were considered and surgical diathermy seemed to be the most logical, particularly since it could be done in stages, fully under control, and with very little or no risk. The scars resulting from diathermy are soft and uncomplicating, and the contractures always slight.

The term "electrocoagulation" is sometimes used in place of surgical diathermy. By this method heat is generated in the tissues by the resistance produced by the passage of a high frequency bipolar current of sufficient intensity to destroy the neoplasm. The current is of the d'Arsonval type, with a relatively low voltage and high amperage.

The active electrode is a piece of music wire, gauge No. 23, 42 c.m. long and sharply pointed at one end, and bent at right angles 36 c.m. from the point; beyond the bend it measures 6 c.m. The blunt end is fastened into the coagulating handle. For partial insulation, a rubber tube 33 c.m. long, outside diameter 3.33 m.m., wall 0.8 m.m. thick, is passed over the wire.

The indifferent electrode was applied to the outer aspect of the left thigh. It consists of a sheet of block tin 20 c.m. square and 0.38 m.m. thick. The skin was covered with a heavy lather and the electrode applied and held in place with a gauze bandage supplemented by a rubber web bandage.

The equipment consists of a portable cabinet with a three-stage Tungsten-point spark gap and a five-point rheostat control. The transformer is of the dry type, depending on air and spacing for in-

*Read before the American Bronchoscopic Society, Atlantic City, New Jersey, May 20, 1925.

sulation. The condensers are triple and of solid mica plate construction. The alternating current used was 110 volts, 60 cycle.

REPORT OF CASE.

A man, age 41 years (Fig. 1), had always been well save for frequent "colds," until December, 1919, when he began to expectorate blood frequently, and had a slight elevation in temperature. Pulmonary tuberculosis was diagnosed, and the patient sent to New Mexico for treatment. This diagnosis could not be confirmed, but the occasional expectoration of bright red blood with cough continued without loss of weight or strength. After about three and one-half years, the patient had a very severe attack of pneumonia and was ill for three months. Following this he had considerable

Fig. 1. Photograph of patient, age 41 years.

dyspnea on the slightest exertion, with frequent asthmatic seizures and cough. All symptoms were particularly noticeable during the winter months. For two months previous to examination, the symptoms were somewhat less severe.

On general examination, in June, 1924, the patient seemed to be in excellent condition, but examination of the chest revealed evidences of an obstructive lesion of the right main bronchus. The respiration and cough were typical of a stenotic lesion in the trachea. Roentgenologic examination of the chest disclosed an apparent thickening of the pleura on the left side. June 27, a bronchoscopic ex-

amination under local anesthesia revealed a tumor arising from the right and posterior wall of the trachea just above the bifurcation (Fig. 2). The mass was so large that the bronchial openings could not be identified. The growth appeared to be malignant, but a piece of tissue removed from the base of the lesion proved to be inflammatory fibrous tissue only. July 9, under local anesthesia, bronchoscopy was again performed. The superior wall and part of the face of the tumor were easily determined. Its base was sessile and firmly attached to the trachea. It was soft and thus readily penetrated by the sharp point of the active electrode.

The point of the active electrode was inserted into the center of the presenting wall of the tumor, and as soon as the rhythm of the

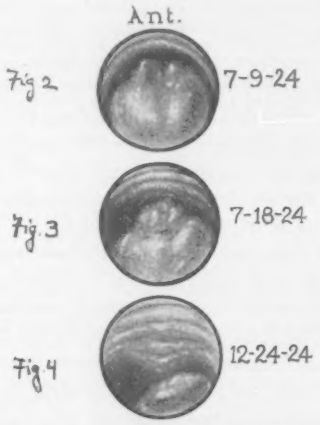

Fig. 2. Initial appearance of tumor of the trachea.
Fig. 3. Appearance of the tumor after the first treatment.
Fig. 4. Appearance of the tumor five months after treatmentt.

respiratory movement was determined, thus insuring against accidental contact between electrode and bronchoscope, the current was turned off and on by the assistant. The coagulating time varied from 20 to 30 seconds. It was necessary to coagulate just to the point of solidification since any slight carbonization produced fumes which brought on coughing. About 30 or 40 per cent of the tumor was coagulated at the first operation, when between 150 and 200 milliamperes of current, and rheostat point No. 3, with two stages of the spark gap slightly open, were employed. Nine days later another bronchoscopic examination showed that the tumor had been reduced 50 per cent. Its apex was quite necrotic (Fig. 3). The

patient had coughed up small pieces of the degenerated tissue five or six days after destruction of the mass. There was now much less obstruction to breathing.

A second attempt at coagulation with the same factors was made, but owing to the necrosis and edema in the tumor, it was impossible to determine the active portions of the lesion. The patient then returned home. For a month he was in excellent condition and able to exercise strenuously without dyspnea. He then contracted a "cold" with a little fever and spat up a small quantity of blood. Examination of the chest, Dec. 24, again showed obstruction of the breath sounds over the right side, but not nearly so marked as at the first examination. Bronchoscopic examination now revealed that the tumor was about one-fourth as large as the original growth (Fig. 4). The remaining tissue was coagulated, using the same settings. A course of radium treatment was carried out, the radium being applied to the sternum over the site of the lesion. Ten areas, measuring 4 c.m. square, were mapped out and to each area 50 m.g. of radium element (sulphate) was applied for 14 hours. The filtration was through the 0.5 m.m. wall of the Universal silver tube applicator, 2 m.m. of lead, and 2 m.m. of Para rubber, and maintained at a distance of 2.5 c.m. by the interposition of a balsa wood block, 3 x 4 x 2.5 c.m., for a total of 7,000 m.g. hours.

Reaction from the radium treatment was negligible; there was only slight nausea and weakness for a short period. After each treatment convalescence was uneventful, without shock or pain. About three months after treatment there were no symptoms referable to the lesion. The patient will return for further observation and possible treatment about six months after the last treatment.

CONCLUSION.

We believe that surgical diathermy has a place in the treatment of neoplasms in the areas revealed by the bronchoscope. Perfect high-frequency currents should be employed, as they generate regularly, and are well balanced.

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Mayo Clinic.

THE EIGHTH ANNUAL MEETING OF THE AMERICAN BRONCHOSCOPIC SOCIETY.

THURSDAY, MAY 21, 1925, MORNING SESSION.

(*Continued from Page 156*)

DR. JOS. C. BECK: I think there is one point which has not been sufficiently emphasized; that is that in emergency tracheotomies, the tract is not only displaced, but there is a pulling down of the trachea through the effort in breathing. The bronchoscope would help in studying the trachea in that instance. I have had considerable experience in an institution with which I am connected, and I instruct my internes to do tracheotomy in that event. I have given them Schroetter's tube to study the trachea, but in assisting breathing by this hard rubber tube one can see where the bronchoscope would be a good deal better, although, of course the internes are not familiar with the bronchoscope. I remember a case of a large adeno-carcinoma of the thyroid in which the trachea was so compressed and pushed to one side that it caused great difficulty in breathing. In going through the mass trying to find the trachea, the work would not have been possible without the help of the bronchoscope. The patient was an old lady and I was able to use the bronchoscope with advantage in her case. I was able to cut slowly through the carcinoma and do a tracheotomy.

DR. T. E. CARMODY: The point which Dr. Chamberlin brings out is a good one. We are not all as successful as we might be. I have been a long time getting into the trachea in some cases. In cutting down on the trachea instead of cutting down direct, we may go here or there. If we have the bronchoscope in place we can cut down on it directly. The Schroetter tube is a very good apparatus in some cases, because it pushes the trachea forward. In Dr. Lewis' cases the method would be very valuable to get rid of infection. If he did tracheotomy first he would not introduce infection. I think in the infections of the neck and floor of the mouth, bronchoscopy would be a valuable aid. It would also be of value in diphtheritic cases. We can remove the foreign body from the trachea before doing tracheotomy. Sometimes a piece of membrane will block the trachea and will lose the patient for us. I think there might be a danger of going through the anterior commissure and getting stenosis of the larynx.

DR. H. B. ORTON: I think tracheotomy itself is a very valuable procedure. I have followed the method of Dr. Lewis in many cases. In a case of carcinoma of the thyroid the patient stopped breathing at operation. I have passed the bronchoscope and was able to cut down on the trachea and bring the patient through the crisis. I have used the Jackson method with the thumb and second finger.

DR. HARRIS P. MOSHER: I would like to end this discussion. I do not want to give the impression that I am not in favor of this procedure. Ten years ago I got a small bronchoscope, which we called the Mosher life-saver. It had no light in it, but for ten years I did tracheotomies leisurely with the aid of this device. Later it was modified and made in two sizes, for infants and adults. The two types are mentioned in my book.

DR. ELLEN J. PATTERSON: I had a case of enlarged thymus with deviated trachea in which it would have been impossible to do tracheotomy safely without the aid of the bronchoscope. One advantage in doing tracheotomy by this method is that oxygen can be given to the patient during the opening of the trachea.

DR. LEWIS (closing): I am sorry to have given the impression to any claim of priority for this procedure. While it has been performed by others no doubt many times before, yet patients have died for the failure to use this procedure. My object was only to bring it to the attention of this Society so that others might benefit by my experience, which I have related. I feel quite confident that had it not been used in my case, the patient would have died. He was exhausted fighting for air and there was pus in the tissues and secretion in the trachea.

DR. GILL: When I gave the title of my paper to the Secretary of the Society I did not know that Dr. Lewis was going to read a similar paper. I recall reading several textbooks on laryngology and did not find any mention made of this particular technique. In regard to Dr. Dean's remarks, I do not think anyone should attempt to pass a bronchoscope until he has had sufficient training to admit him to expose the larynx and introduce the bronchoscope in one minute's time. I wish to refer again that this is a simple and safe procedure in the hands of one who is trained in this particular specialty.

Foreign Bodies in the Tracheobronchial Tree. Report of Cases in Which Bronchoscopy Was Not Done. Dr. Louis H. Clerf.

DISCUSSION.

DR. MYERSON: I hoped when I saw the title of this paper that it would include a certain type of case for which bronchoscopy might not be considered successful. Dr. Imperatori had a case some years ago, and I had a case of a 7-year-old boy, who had a large bead in the trachea. Practically all the air was going through the central opening of the bead. Expiratory effort would ram it up against the glottis and with inspiration it would recede down to the bifurcation. Bronchoscopy was done with difficulty on account of the trauma to the larynx. After 15 minutes of bronchoscopic removal I did a tracheotomy and removed the bead with forceps. I felt very keenly the need of some word from more experienced bronchoscopists who have seen cases of this type. We want to have them give us data to guide us when we encounter cases of this kind.

DR. H. B. ORTON: I have had four cases in which the foreign body was coughed up spontaneously. One woman was an epileptic, who during an attack of *petit mal*, inhaled a tooth. She coughed up five pieces at various times. I made arrangements to bronchoscope the sixth, but that piece was coughed out. There is still another piece there. Another case was that of a boy with peanut in the right bronchus for one month. Before he came for bronchoscopy he coughed it up. Another was a man referred to me recently, who inhaled an extracted tooth with a filling. He has coughed up part of the tooth and three pieces of filling.

DR. JOS. C. BECK: It was an electric bulb of a toy lamp which had slipped down into the bronchus of a boy, age 4½ years. I attempted its removal by direct bronchoscopy, but after working for over a half-hour without locating it I stopped. Following this procedure, considerable edema of the larynx resulted. Therefore the next day I did a tracheotomy through which I passed the bronchoscope and found the foreign body. In order to be sure, I took a blunt-pointed probe and touched it, patient not being very deeply anesthetized, this manoeuver produced a cough which caused the foreign body to be expelled through the bronchoscope, hitting me in the face. That was my first and last case of bronchoscopy in children, for since that period, bronchoscopy at our institution is done by Drs. Boot and McGinnis, who specialize in that field.

DR. T. E. CARMODY: I have had two cases of the kind. In one there was a penny in the bronchus of a 19-year-old mental defective. I tried twice to get it up. I saw it easily, but could not dislodge it. Later the boy got a cough from sleeping on the grass, and he coughed up the penny. In another case a child had aspirated a peanut two weeks before. When he came to my office he started to cough and coughed up the peanut. We followed the history for a while, but there were no further symptoms, so that must have been the only piece.

DR. VAUGHAN: Just before leaving home a practitioner told me about an interesting case he had had. A child gave a history of having had pneumonia twice in the winter, and of having had asthma all the winter. The temperature of the child was 99° and on making examination of the chest he found there was no air in the right lung. He told them to put the child to bed. Next day they called him in a great hurry. He took an hour getting there and when he did he said pus was all over the room and the child had coughed up a full-sized peanut. Then the parents remembered that the child had choked when eating peanuts at the fair last fall.

DR. E. G. GILL: I recall having had a case, a child who had aspirated a piece of lamp chimney. On examination of the child, the portion of glass could easily be seen lodged between the vocal cords. The child was breathing with the greatest of difficulty. In attempting to remove the glass the child coughed and the glass was aspirated into the post-nasal space. It was imbedded so deeply into the tissues I did not attempt to remove it. It has now been three years since I last saw this patient, but I have been informed by its parents that it has made a complete recovery.

DR. W. L. SIMPSON: I have had four cases. One was a tooth case which I sent to Dr. Jackson. It was coughed up in the Jackson Clinic, just before bronchoscopy. Another case I would like to mention. About three months ago a woman came with a definite history of swallowing a small fish bone and she developed a very severe tracheal bronchitis. It looked like an ordinary purulent bronchitis and she was advised against bronchoscopy by the internist. Nevertheless I made an examination. I examined the larynx and trachea, but did not find it. It was coughed up a week later. What would Dr. Clerf do in such a case? I was advised not to make a thorough search. Certainly if she had had a fatal attack I could not have been criticized.

DR. ELLEN J. PATTERSON: I have had several cases where the foreign body was coughed up spontaneously. In one case a man, age 44 years, had a tooth extracted. The dentist lost the tooth, but fortunately the patient realized what had happened and had an X-ray made at once, which showed the tooth in the left lung. This man had a heart lesion with a very irregular pulse, and shortly after admission to the hospital he coughed up the tooth. In another case, a child in the ward at the Children's Hospital aspirated a common pin. The pin could be located on the X-ray in the left lung. Before we could bronchoscope the child the nurse found the baby playing with a pin. Another X-ray was taken, but it was negative for foreign body. In another case, a young woman, age 18 years, aspirated a Red Cross button. There was present the asthmatoid wheeze, typical of movable foreign body in the trachea, and the X-ray showed the button in the trachea.

On the way to the operating room the patient coughed. I bronchoscoped the patient, but did not find the foreign body. She was taken to the X-ray room again, and the pin was located in the nasopharynx. In one case we had a bead coughed up before bronchoscopy, but instead of being coughed through the glottis, the bead dropped down the left bronchus.

DR. CLERF (closing): With reference to Dr. Myerson's case of bead in the trachea, I would refer him to the charts prepared by Dr. Jackson, in which he designates the forceps used, the problems involved and the effectiveness of the methods utilized. One cannot lay down definite rules; however, in a general way, this type of foreign body requires some form of cup or ring forceps. In Dr. Orten's case the patient cannot be criticized for deciding against bronchoscopy. After coughing up six tooth fragments the natural inference would be that the seventh fragment also would be coughed up. In Dr. Simpson's case there was a clear indication for a diagnostic bronchoscopy. Given a history of choking on a foreign substance, the case should be considered one of foreign body until proven otherwise. If there is still a question after careful

physical examination and X-ray study, a diagnostic bronchoscopy is indicated.

Surgical Diathermy for Tumors of the Trachea. Dr. Harry H. Bowing and Dr. Porter P. Vinson.

DISCUSSION.

DR. L. W. DEAN: I think that Dr. Vinson has used wonderful ingenuity in manipulating this electrode. He spoke of piano wire. How did he insulate, and what kind of arrangement did he have for working the bronchoscope?

DR. CHAMBERLIN: How did you get a flexible wire into the growth?

DR. VINSON (closing): All of the details of the technic are given in full in the paper. I used a stiff piano wire insulated with rubber and it was quite easy to introduce the pointed end of the wire through the bronchoscope into the growth.

PROPOSED AMENDMENTS TO THE CONSTITUTION OF THE AMERICAN BRONCHOSCOPIC SOCIETY.

Article 4, Section 5. At each annual meeting the presiding officer shall appoint a nominating committee, consisting of three (3) members. This committee shall present to the Society the name of a candidate for each of the offices of president, vice-president and secretary-treasurer. Other nominations may be made from the floor. The Society shall then ballot upon the names of the candidates for the various offices.

Article 4, Section 7. The retiring president and the past president shall automatically become members of the special committee, who with the titular officers shall constitute the executive committee.

Article 4, Section 8. Fifteen (15) members shall constitute a quorum for the transaction of business.

Article 6, Section 1. The reading of any paper shall not extend beyond twenty (20) minutes. This shall include the paper, together with the exhibition of lantern slides, pictures and demonstrations.

Article 6, Section 2. The time of discussion shall be limited to five (5) minutes.

Article 6 to be changed to Article 7.

THE KANSAS CITY EYE, EAR, NOSE AND THROAT CLUB.

Meeting of September, 1925.

Case Reports. Two Cases of Combined Fractured Larynx and Trachea. Dr. Alvin J. Lorie.

We wish to add two cases of combined fracture of the larynx and trachea to the fifty-three cases reported by Alex Zeuch, 1922. Hoffmeister reports mortality in combined fractures of larynx and trachea as 83 per cent. In our two cases both recovered.

Case 1 illustrates the type of neglected combined fracture of the larynx and trachea. History A. P. P., girl, age 11 years, thrown through the windshield of an automobile, crossbar striking her larynx and trachea. She also received numerous superficial cuts about her face and hands. She had extreme difficulty in breathing following the injury but, as she lived in a small western Kansas town, her condition was not recognized. Three weeks after the injury she was brought to Kansas City and to our attention.

Examination at this time revealed extremely cyanotic child, tremendous labor in breathing, partially conscious. Immediate high tracheotomy under local anesthesia was performed. The patient's respiration immediately improved, and from then on she gained rapidly in strength and weight. Examination revealed very small slit through the larynx to the left, both thyroid cartilages and arytenoids had been broken, the whole larynx displaced to the left, and the cartilages tremendously thickened and fibrosed.

The trachea had been torn loose from the base of the larynx, from the cricoid cartilage in the region of the ligamenta agulari. As much as it was too late to replace fragments and, due to the extensive involvement inadvisable to operate upon the cartilages, the larynx was dilated from below, upwards through the tracheotomy wound, by means of Jackson dilators, over a period of twelve months. The patient made an uneventful recovery and, at the present time, after two years, has resumed all her activities in school, has a very fair speaking voice, of a very hoarse, guttural type.

Case 2: This case illustrates the combined fractured larynx and trachea that received immediate attention. The patient, while working on the ground in a construction gang on the erection of a large building, was struck across the front of the neck, larynx and trachea by the end of a steel cable which had broken loose from a crane. The patient was seen three hours after the injury. At this time the patient was semiconscious, tossing from side to side in bed, and extremely cyanotic. An immediate high tracheotomy was performed in bed. On reaching the trachea it was found that the first two tracheal rings, anterior, on the front of the trachea were split wide open. Tracheotomy tube was inserted through this opening. After a very strenuous convalescence of a week, the patient recovered sufficiently so that, by means of suspension laryngoscopy the fragments of the left thyroid, which had been fractured, were replaced and held in place by packing. This was continued over a period of ten days. The tracheotomy tube was removed and the trachea pulled together. The patient has, at the present time, after three months, a fair speaking voice with a very small amount of obstruction in the larynx. We perhaps would have had a better result, but he was extremely difficult to handle on account of his fondness for alcohol.

Report of a Case of Congenital Atresia of the External Auditory Meatus with Facial Paralysis and Cholesteatoma. Dr. Paul Lux.

The complication of cholesteatoma in this case is very rare. In fact we could find no report of such a case in the literature. The etiology of

congenital atresia of the external auditory meatus has not been definitely established. Some writers attribute it to a congenital predisposition due to syphilis or alcoholism in the parents, others to changes during intrauterine life. Alexander and Bensi state that deformities of the auricle begin the second month of fetal life and are almost always accompanied by atresia of the external auditory meatus. The task becomes quite difficult when one tries to find the cause for the functional disturbance in the facial nerve. Mischel, in the report of his case, looked upon the facial condition as the result of a hindered voluntary impulse. He therefore undertook the treatment of the nerve by farradic and mechanical means. He noticed a marked improvement in the nerve function.

The case in question is that of M. H., age 6 years, entered St. Joseph Hospital, Oct. 6, 1923. Mother and father both living and healthy; one sister, age 8 years, normal child. Patient has had chickenpox and pertussis—no sore throat. Paralysis of the right facial nerve since birth. According to the mother, the delivery was normal, except that the umbilical cord was thick and wound around the baby's neck.

Examination: Pronounced swelling right side of head, extending from in front of the ear for about 2½ inches backwards and upwards to the temporal region.

Eyes: Pupils round, light and convergence reaction normal, corneal reflex weak on right side, fundi normal. In attempting to close the eyes, the right lid remained half open. In an effort to show teeth, the mouth was drawn to the left.

Ears: Right auricle absent. In its place were two rudimentary appendages, not connected, and about the size of a small butter bean. In place of the external auditory meatus was a pin-point opening too small to admit probing with the ordinary searcher; left ear normal.

Cochlear Examination: Weber to right; Rinne and Schwabach not definite; C-1 not heard on right side; left normal; C-4 indefinite right, normal left; whispered voice right side ad concham, left 10 m.; conversational voice, Barany apparatus, heard on right side ½ m.; left 10 m.

Internal Examination: Heart and lungs negative. Nose and throat negative.

Neurologic Examination: Neurological history obtained from the mother was that the child had, since birth, a paralysis of the muscles of the right face, that she was unable to close the eye, lift her eyebrow, laugh or cry on the right side. Her mother also volunteered the information that, while in the beginning the child was unable to close her eye at all, recently there has been marked improvement to the extent that the lid comes almost all the way down.

Examination revealed a partial Bell's palsy—the little girl was able to close completely the right eye, but could not raise the eyebrow on that side. The right nasolabial fold was obliterated. There was some wasting of the muscles of the right face. The muscles of mastication were functioning normally. There was loss of the sense of taste on the right anterior surface of the tongue, also paralysis of the soft palate on the right, the muscles did not show a complete reaction of degeneration.

Wassermann: Father, mother and child, negative.

On admission to the hospital the temperature was 100.2°; pulse 120; respiration 34. The case was diagnosed as an acute exacerbation of a chronic mastoiditis with subperiosteal abscess.

The following day, mastoid operation. Incision behind the rudimentary ear, with discharge of enormous quantity of foul smelling pus; cortex soft and mushy. With the removal of the cortex a large cholesteatomatous mass presented itself. When this was removed, it was found that a perfect radical mastoid operation had already been performed by the pressure atrophy; even the facial ridge had entirely disappeared. Because the abscess had undermined such an extensive area, a counter incision was made and tube inserted, mastoid packed. The case went on to uneventful recovery. Several weeks later an otoplastic operation for cosmetic effect, was performed.

This report was prepared with the intention of bringing out the following points:

1. The occurrence of congenital innervation disturbance of the facial nerve.
2. Nearly all cases of mikrotie are accompanied by atresia of the external auditory meatus.
3. This condition is almost always right-sided.
4. That the facial nerve should be tested to find out whether or not there is complete destruction. In case some function remains, it will be found that marked improvement will follow proper treatment of the nerve.

Case Report. Fibroma Posterior Nares. Dr. E. E. Pickens.

This case came under observation in November, 1924. He gave the history that for the past six months he had not been able to breathe through the left side of his nose. No pain or discharge. General physical condition good. Past history negative. Family history good. Wassermann negative.

Examination of the nose showed a tumor far back, filling the posterior part of the cavity. Seems it originated high up, near the middle turbinate. The examination of the nasopharynx showed a very red cauliflower-looking mass, partly extending into the nasopharynx and over an area around the mouth of the left Eustachian tube. Felt very hard. Bled very freely when small piece, removed with snare, for pathological examination. The pathologist reported that it was a sarcoma. The patient was put on large doses of radium and X-ray at intervals for a period of about four months.

At the present time, ten months after first observation, the tumor is about one-third its original size. The patient can breathe fairly well through this side of his nose. Has no glandular involvement. General condition good.

This tumor evidently is a fibroma and has improved very much under X-ray and radium treatment.

Report of Case: Radical Mastoidectomy with Marked Improvement in Hearing. Dr. J. H. Laning.

This case was a child, female, age 4 years, admitted to Mercy Children's Hospital, January, 1925. A history of discharging ears since the age of two months. Hearing was reduced to the shouting voice. The child did not talk. Had a cleft palate involving the soft parts. General physical examination was negative. Laboratory findings, including blood Wassermann, negative. The radiological report showed a clouding of mastoid processes with no cellular structure on either side.

One month after admittance a radical mastoidectomy was done on the left side and three months later on the right. At time of presentation, three months after last operation, child could hear the spoken voice in the right ear at 8 feet, and in the left ear at 16 feet. She was beginning to try to talk. The right ear was dry. The left was moist. The cleft palate is to be operated soon. The operator claimed nothing new in his operative procedure or subsequent treatment, but did consider that the improvement in hearing was unusual.

Meeting of November, 1925.

Symposium on Mastoiditis.

The Diagnosis of Acute Mastoiditis. Dr. O. Jason Dixon.

This discussion will be limited to the diagnosis of acute surgical mastoiditis. That is, infection within the mastoid process which, owing to the nature of the infecting organism, the resistance of the patient, and the amount of tissue involved, demands surgical relief.

Kerrison defines acute mastoiditis as an acute inflammatory process originating in the antrotympanic cavity and spreading thence to the mastoid cells proper.

The probable course, he divides into three stages, namely: 1, the stage of vascular engorgement and cell infiltration; 2, the suppurative stage, characterized by the presence of fluid pus; and 3, the stage of osseus necrosis or softening.

These three stages may be easily demonstrated at operation, yet during their process of development they are difficult to differentiate. In their formation they present such a variable and confusing clinical picture that the diagnosis of surgical mastoiditis, even when under the closest observation, is often difficult to make.

As in all obscure surgical conditions, the history is frequently the most important aid. It is so in the diagnosis of mastoiditis.

Regardless of the clinical picture, the history of the previous middle ear infection is always a valuable guide in the management of the acute exacerbation.

This previous history should date back to infancy and may be confirmed by drum findings that are indicative of old trouble, that is, scars or perforation.

The onset of the ear disturbance is a good lead to the amount of mastoid involvement to be expected.

Sudden severe ear pain which produces shock to the patient, with a sharp increase in fever and a leucoccytosis is a good indication of early extensive disturbance in the mastoid cells. Particularly is this true if unrelieved by drum incision and free drainage.

There is no single controllable factor which so predisposes to mastoiditis as failure to secure free drainage at this stage.

Certainly no middle ear which has even been infected is as free from further trouble as a noninfected ear.

Pathological findings and late recurrences of ear complications indicates that an infected ear never becomes normal again.

Of additional diagnostic value is the character and amount of discharge and the type of infecting organisms.

Rosenow has proven the selectivity of bacteria for different tissues and the mastoid process is no exception. The history of other cases of mastoiditis in the immediate family, or in patients confined to the same hospital ward also may help in reaching diagnosis.

These infecting organisms have a seasonal increase in virulence, which is more active during the late winter and early spring months.

Symptoms: The first subjective symptoms of mastoiditis is usually pain, which comes on suddenly during the course of the otitis media.

It is deep-seated in the region of the mastoid process and gradually gets worse. It is unlike the pain associated with the early otitis.

While this pain is apparently not severe enough to cause insomnia, yet the patient frequently complains of his inability to sleep. Loss of hearing may be quite noticeable, especially in bilateral ear involvement.

Sudden suppression of aural discharge with an increase in pain is an unfavorable symptom, especially when the pain is unrelieved by a renewed flow of pus.

A copious discharge of pus, which is beyond the capacity of the tympanic cavity, is also evidence that there is considerable mastoid involvement.

Fever: This is an unreliable symptom. It is always present to a moderate degree in the early stage of mastoiditis and frequently subsides as the disease progresses. Absence of fever is no indication that the mastoid cells are not extensively diseased.

Loss of weight or failure to regain lost weight is commonly found in patients who are not making a spontaneous recovery from mastoiditis. That the mastoiditis was the cause is proven by their rapid post-operative gain.

Ear Findings: The drum is red, thick and bulging, and through the perforation is oozing a thick pulsating discharge of pus. There is an extension of the bulging drum into the superior canal, which is frequently sagging. This sagging of the superior canal wall is recognized as one of the positive indications for operation. It is a periostitis of this area which, owing to its position, occurs earlier than the postauricular bulging.

It is not always present, and even when present without other clinical evidence, is not an indication for operation. That it bears a close rela-

tionship to the mastoid disturbance is shown by the rapidity with which it clears up following operation.

Mastoid Tenderness: Sensitiveness to pressure over the mastoid cortex can be elicited in nearly all cases of acute suppurative otitis media.

Coming late in the course of this disease, that is, third or fourth week, and with marked tenderness over the tip or posterior row of mastoid cells, it is distinctly an indication of mastoiditis.

However, there may be an extensive involvement of the mastoid without this finding. Children with a thin cortex are more apt to have this sign.

Post-auricular edema is evidence of a perforating infection through the cortex and is common in children on account of their soft bone. It may be added as another positive sign of mastoiditis, but should be carefully differentiated from a cellulitis following a furunculosis of the auditory canal. Erysipelas or trauma may also produce this sign.

The use of the X-ray may be a distinct help in diagnosing some cases of mastoiditis, but it should never act as a substitute for clinical findings. If it agrees with the clinical picture, very well, but should it disagree, disregard the X-ray.

Laboratory: The use of the laboratory is of little help in the diagnosis of uncomplicated mastoiditis. The leucocyte count fluctuates with the temperature. The hemoglobin and red blood count are more valuable guides as to the manner in which the patient is handling his infection.

While the value of these signs and symptoms is not to be depreciated, yet they are not always of primary importance.

One must bear in mind three factors which constantly enter into the diagnosis of acute mastoiditis. They are:

1. The manner in which the patient is handling his infection.
2. The risk of serious complications.
3. The impairment of the functions of the ear.

We must also remember that we are dealing with the patient in addition to his infected ear, and that he can, and does develop complications far removed from the ear, which in themselves adds to the confusion of the problem.

Indications for Operation. Dr. Virgil W. McCarty.

By all means the most difficult part of a surgical symposium is the effort to give a useful presentation of the indications for operation. Each case of suppurative otitis media is a clinical entity and it is not possible in a paper or a textbook to give a direct set of rules for surgical interference to cover all cases. Consequently in this short discussion the writer wishes to give you his personal ideas about some of the signs and symptoms which seem to make such surgical interference desirable.

In a general way one must speak of the indications for operation from the point of view of the safety of the patient and the safety of the function of the organ of hearing—provided that the latter has not previously been destroyed.

Past question, every aurist of intelligence and experience has seen cases of mastoid suppuration of the severest type recover without operation, yet the aural surgeon who waits until symptoms are present rendering surgical interference absolutely necessary, often uselessly endangers his patient's life from complications of an otherwise simple case.

Indications for posterior drainage in suppurative otitis media fall naturally into those for acute infections, and those for chronic infection.

In acute suppuration many cases are very simple, presenting the periostitis, with edema or periostial abscess, pain over antrum and tip, with profuse drainage and moderate fever. This syndrome is more frequent in children than with adults.

More difficult are the cases with a discharging ear, with no edema. No changes in the canal wall, no localized pain, but which do not get well.

A justifiable classification of the indications for mastoid operation in acute otitis, in the order of their importance, would be:

1. Changes in the bony wall of the canal, usually a lowering of the posterior superior wall.

2. The persistance of pain in the ear, after free drainage is established through the drum. This is an important and neglected sign.

3. Localized, persistent bulging of the drum in the upper half, with free drainage from the ear. Another important and neglected sign.

4. The persistance of a profuse discharge for a period of more than six weeks, with or without other symptoms. This is, of course, not on arbitrary time and certainly many cases will resolve after a longer period, but a statement of a belief that where as simple and satisfactory a procedure as a mastoid operation is available, it is not justifiable to jeopardize the hearing of any individual by permitting an acute otitis to become a chronic one.

5. Any definite symptoms leading to a diagnosis of intracranial complication, except diffuse meningitis. This group would include sinus thrombosis, and the dural and brain abscesses. Discussion of the various indications for operation of intracranial operation is not possible in a paper of this scope. Operation in diffuse otitic meningitis is of extremely doubtful value.

In chronic suppurative otitis media, indications of operation depend upon many factors, not the least of which is the consideration of the patient's hearing. A chronic suppurating ear, with fairly good hearing, presenting no symptoms except discharge should not be operated—whether the infection is unilateral or bilateral.

Cases presenting a combination of definite attic suppuration or cholesteatoma, with loss of useful hearing should be operated as well as those cases which show any form of meningeal irritation. Here, as in the intracranial complications of acute otitis, the scope of the paper prevents discussion of the diagnosis of intracranial complications.

Chronic suppurative otitis media is a rare factor in focal infection and operations done to relieve an unknown focus are usually of no value to the patient.

The X-ray, while a frequent aid in diagnosis, may not replace the clinical indications for operation and should not be used as a guide as to when to operate.

Complications of Mastoiditis. Dr. Alvin J. Lorie.

In dealing with complications of mastoiditis, we can group them into two general groups under the headings: Extercranial and intercranial; or we could group them into groups, "local" and "remote." They can also be further divided by dealing with complications of acute mastoiditis and chronic mastoiditis. In a paper such as this, where the time is necessarily very limited, we can only hit the high lights of these conditions and for brevity we will take the heading as given first above, namely: Extercranial and intercranial complications.

Extercranial complications.

1. One of the most simple and frequent complications is an infected auricle. This is due to the extension of the process into the auricle by trauma, or a fold from the tight bandage, characterized by local pain and temperature, dealt with by local applications and correction of the bandage.

2. Local reaction of the soft tissues, such as edema, local abscess or localized erysipelas. Treatment is simple and need not be discussed.

3. Furunculosis of the canal, due to infection of the follicles, or clefts, of the canal. In our hands, use of genitian violet, or mercurochrome is most efficacious.

4. Localized dermatitis, due to the use of iodoform, xeroform, etc., gauze. Removing the cause by using plain gauze and zinc oxide will take care of this condition.

5. The sudden, unaccountable rise of temperature with local pain, two or three days after mastoid operation, should make one suspicious of erysipelas. A very good diagnostic sign of this condition presenting itself, at least twenty-four hours before erysipelas can be diagnosed locally, is spontaneous nystagmus, horizontal in character, of one degree to both

sides. I think it has been definitely proven that no specific treatment influences erysipelas. It is self-limited, from 7 to 10 days. Mortality is 10 per cent, but most of these deaths occur in the aged. Erysipelas sweeps through a mastoid wound like a forest fire, but always leaves a clean wound behind. The quickest way to heal a mastoid that I know of is to give the patient erysipelas.

6. Cervical adenitis. This may follow perforation of the tip. If the perforation is in the posterior undersurface of the tip with the formation of an abscess below the digastric muscle and under the sternal mastoid muscle, it is called Bezold mastoid. Or we may have a simple enlargement of the glands from infection of the lymphatics. The first must be drained; and the second, if no suppuration takes place, can be best treated by heat.

7. Pneumonia. This may be following the anesthetic or may be blood borne. We need not discuss the treatment.

Pyelitis. Specially liable to occur in children, and should be looked for first over repeated urinary examinations before laying a temperature, and at times sudden chills coming from this, to a sinus infection. Acute nephritis is a rare condition, but does occur also.

9. Acute endocarditis. This is a rare condition, most frequently found following the extension of the trouble into the lateral sinus. Symptoms are typical.

10. Acute pharyngeal or tonsil infection not infrequently follows.

11. Following (10) the other ear may become involved and should be inspected frequently.

12. Subperiosteal abscess, due to a rupture of the cortex. The infection may spread under the periosteum with local manifestations, such as swelling, pain, and redness, depending upon the length of time the condition exists.

Intracranial complications.

These conditions are of such tremendous importance that a monograph can be written on each and it is evident that we can only touch upon and name the high points.

1. Lateral sinus infection: Two general types (1a) the acute, explosive sinus infection, with acute rise of temperature and chills, headache, stiff neck, Koenig, positive or negative blood culture, usually with a high polymorphonuclear leucocyte count. (1b) Slow type, lassitude, loss of appetite, headache, one to two degrees of temperature, 15,000 leucocyte counts or better. Temperature of two to three degres, which doesn't go to normal. This may be due to a small mural thrombus or something of that type. The treatment is operative. Toby, of Boston, at the last Academy meeting, brought out his new diagnostic sign with examination of spinal fluid in a monameter with pressure on the jugulars.

2. Thrombosis of the superior and inferior petrosal or cavernous sinus. This type is always fatal and treatment is futile.

3. Brain abscess. a. Acute, without capsular formation, may be in any portion of the brain. General signs depend upon the location, whether it is frontal, temporal, middle or posterior. General symptoms are, headaches in all types, vomitting, papillary edema, vertigo and diplopia, drowsiness. Temporal lobe, with special signs, such as speech defects, word aphasia, etc. b. Chronic type may be operated upon with some assurance of success. The method in vogue at the present time is the technique followed by King. One special type of infection is abscess of the apex of petrous portion of the temple bone. This is characterized by Gradinigros Triad. This condition is inoperative and almost universally fatal.

4. Exter- and interdural abscess: These conditions are usually diagnosed on the operating table and easily dealt with there by drainage.

5. Labyrinthitis, either serus or suppurative. The concensus of opinion, at the present time, is that serus labyrinthitis should never be operated, and suppurative labyrinthitis only when you have definitely proven that you have a dead labyrinth.

6. Jugular bulb thrombosis: Symptoms, as with the lateral sinus thrombosis, usually of a severe type, demanding resection of the bulb.

7. Meningisms: Symptoms, due to irritation of the meninges, without infection, self-limiting and curative.

8. Meningitis: Either a local or general. Local meningitis is taken care of usually by a complete mastoid operation, while the general type depends upon its fatality of the invading organism. There have been some cures reported from a general meningitis, which I have always personally questioned, due to spinal drainage and the use of dye products. The Haynes operation for draining the cisterna magna has been universally unsuccessful.

The prevention of these complications is of more importance than the cure and usually can be prevented if the cases are observed and scientifically treated early.

Post-Operative Treatment. Dr. Sam E. Roberts.

In the limited time allowed, I cannot discuss in detail all the different phases of this subject. I will deal only briefly with open healing. I will devote most of the time to the partial closure or modified blood clot method. In the remarks to follow, it is of course, assumed.

1. That all the diseased bone was removed.
2. The operation was performed under strict asepsis.

All the methods of post-operative treatment fail, if the operation was incomplete or improperly performed, or if the wound, already the host of a severe infection to which it has developed a certain amount of local resistance, is further infected by surgical contamination.

There can be no absolutely definite rules for the post-operative care of so severe atypical disease as mastoiditis. Each case is more or less an entity unto itself. There are, however, certain surgical principles that apply to all bone surgery, whether it be in the temporal bone in the long bones of the body. There is no doubt we could learn a great many things from the orthopedic surgeon. We perhaps have all been following, more or less blindly, certain procedures we learned in our early training. We do it now, for no other reason except it has become a part of our routine technique. The three faults to which I wish to refer are:

1. Continuous deep packing of the cavity with gauze.
2. Instrumentation in the wound, such as curettes, for presumed unhelathy granulations.
3. Irritating antiseptics.

There is no question in my mind that deep packing with gauze in the mastoid cavity, prolongs the post-operative care. The gauze acts definitely as a foreign body. Nature throws out an excessive serous exudate in its attempt to push out the foreign body. This is evidenced by the first dressing, which usually is quite clean, even though it has been around the wound from two to four days. If we follow the orthodox method of a dry middle ear before the antrum is allowed to close, we repack deeply into the antrum. The second dressing, when only remaining in place twenty-four hours will be more or less "soppy," even though faultless dressing room technique was used. The outside dressings have changed in appearance from a clean serous bloody discoloration to a tenacious exudative substance, saturating ten to fifteen layers of gauze. After four or five post-operative dressings, the exudative discharge has changed to a thick, creamy pus, saturating from twenty to forty layers of gauze. Our surgical sense tells us all is not well:

1. Nature has been defeated in her attempt to remove the foreign body.
2. Local wound resistance has been lowered thereby and by traumatism from the packing.
3. The serous exudate present at the first dressing, which is almost sterile, makes an excellent culture media for the backfire of organisms from the middle ear, which have come up through the enlarged aditus into the antrum and exenterated mastoid cavity.

I observed, a number of years ago, that my clinical post-operative mastoids, in charge of my interne, progressed to a complete healing more rapidly than my private cases. Internes, by a time honored tradition usually slight the post-operative patient for the more interesting and exciting new surgical case. I found, instead of inserting the packing

deep into the antrum until the middle ear was dry, as I had ordered, they were barely getting it into the lips of the wound, and sometimes I would even find the gauze wick lying on top of the wound! Each succeeding interne was properly admonished, and each would continue to do it the easiest way. His results, however, were entirely too obvious to overlook. I began to adopt his method with gratifying results.

I believe the rubber tube is much less irritating and more effective than gauze packing. I usually use two tubes, one long tube, extending from the antrum out of the lower end of the incision; a second tube, I stitch into the lowest part of the wound, just through the skin and subcutaneous tissues. In uncomplicated cases, I remove the long or antrum tube at the first dressing, in from two to four days. By this time, the essential surgical requirement of a drainage canal has been established. The lips of the lowest portion of the wound are kept open by the small tube, which is just through the skin, as described above. The wound is not traumatized or contaminated by second deep packing. The serofibrinous exudate in the exenterated cavity, immediately begins the process of repair in the formation of fibrous tissue. The approximate periosteum starts osteogenic replacement. The aditus, of course, closes, or begins to close, as soon as the tube is removed. This, in my opinion, is to be desired rather than feared. The incised tympanic membrane should certainly be able to take care of the middle ear suppuration, after being relieved of the diseased mastoid cells. What one of us has not seen a severe middle ear and mastoid infection go on to complete resolution with only tympanic drainage?

As stated in the beginning, no rule of thumb can be applied to all cases. The condition of the patient and the condition of the wound must govern. When the outside dressing is removed in twenty-four hours after the operation, the wound should be thoroughly inspected. If there is a belly between some of the sutures, these sutures should be removed. If the patient is complaining of pain, has more than the ordinary febrile post-operative reaction, or is showing signs of increased absorption, by an increase in the leucocyte count, headaches or chilly sensations, some or all of the following should be done:

The lower sutures should be removed; edges of the wound separated; tube loosened; Dakin drip into the tube and wound, and hot moist packs. Assuming the worst, that the entire wound had to be reopened and treated as an open cavity, this can be done with very little discomfort to the patient in the first twenty-four to seventy-two hours, and I have yet to see any disastrous results follow, when this change in technique was necessary.

The Open Method. The open method of treatment is distinctly indicated in the acute fulminating septic mastoiditis. Especially is this true if the infective organism be the hemolytic strep, or if the systemic disturbance demands early drainage of the mastoid cells before proper "ripening" has taken place. One can surely expect a long post-operative healing, and a stormy course for the patient. The wound has a tendency to spread. If one has ventured several sutures at the upper portion, nature usually removes them by slough, in a few days. Deep antrum packing is again, in my opinion, neither necessary or desirable, after the first three or four days. Wound antisepsis is, however, indicated, and I rely almost entirely on Dakin solution drip, one hour, morning and evening, and gauze saturated in either Dakin or alcohol, laid over, but not into the wound. Unhealthy granulations should be touched with silver nitrate and not scraped with a curette. The frequency of dressings is determined by a very simple test. When the last sponge over the wound is removed, if pus is seen to ooze from the wound enough to reach or nearly reach the skin surface, the dressing has been delayed too long. Usually twelve hours' dressing are ample in the most severe cases, where proper antisepsis has been instituted. In the septic cases, one should have medical consultations constantly at hand. If sepsis continues with the open wound, it shows body resistance has been more or less overpowered and is crying for help. I occasionally have used the various dyes, but I rely mostly on rather large doses of sodium cacodylate, in-

travenously or direct transfusion of whole blood. This sepsis is often mistaken for a thrombosis, and unnecessary and dangerous surgery is undertaken. The medical consultant should be constantly watchful for pyelitis or pneumonia and prophylactic or other treatment given. The otologist, of course, should watch the other ear and the nose and throat for other foci. The salicylates and mild alkalinization is always indicated.

Before closing this subject, I want to emphasize the fact that each post-operative mastoiditis is always a suppurative otitis media and should be treated precisely the same as it was treated before the mastoid opened. I sometimes wonder if we should not dispense entirely with the head bandage, certainly we should on the second day. I have no doubt it is responsible for many persistent otorrheas. Finally, no case of mastoiditis should be dismissed without a functional test for the hearing; if found defective, inflation and other recognized forms of treatment should command our attention.

Conclusions:

1. In all uncomplicated mildly febrile and subacute cases of mastoiditis the modified blood clot method is indicated.
2. The deep antrum tube or gauze should be removed in from two to four days and not reinserted unless local or systemic conditions demand.
3. All tubes or gauze act as foreign bodies, which prevent nature's process of repair.
4. When a change of technique from the closed to open method is necessary no bad effect has ever been noted.
5. The complete open method with deep antrum drainage for several days is desirable in all acute fulminating septic cases of mastoiditis.

DISCUSSION.

DR. JOHN L. MYERS: After the very excellent presentation of papers by these gentlemen, it is difficult to add anything new.

This symposium shows how profitable an evening can be to our Society when facts on (1) diagnosis, (2) when to operate, (3) complications, (4) post-operative care, of mastoiditis are presented, and each by a different man. My purpose in discussing certain points set forth by these men is more to emphasize them than that I have any hope of giving anything new.

What Dr. Dixon said about complete history cannot be too strongly emphasized. Often it is necessary to get a statement from the mother of even an adult patient, for he may not know, or may not remember, that he ever had ear trouble; what seems to be an acute attack may, in reality, be a recrudescence of trouble the patient had suffered from many years before.

Dr. McCarty's statements on when to operate were well put. There would be truly a great burden removed from every surgeon if he could always be sure of the exact time to operate. I suppose everyone of us have, at times, waited longer than we should have done because we did not want to be radical. Just when to operate takes all the surgical sense that we have.

Dr. Roberts' paper on post-operative care is timely. Personally, I feel that we have used gauze packing too much and too long. It interferes with our purpose, in that it dams back the infection which we wish to drain out. I have found the rubber tube better in my work. This tube should be long enough to extend from the antrum to the lower part of the incision at the tip of the mastoid, and should have small holes in it. It should lie deep in the wound, and each day it should be drawn out about a quarter of an inch or more.

By using this I have found that the wounds drain perfectly and it seems to me that they heal more rapidly.

In my experience, diathermy has served well in cases where the hearing has been impaired by the operation. If there is any place that diathermy is indicated it is where we have a fibrosed condition in the middle ear. Often it is surprising the improvement in hearing which is secured by using diathermy as a method of treating ears where the hearing has been reduced by a mastoidectomy.